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AN

EXPOSITION

OF

THE PRACTICE OF AFFUSING

COLD WATER

ON

THE SURFACE OF THE BODY,

&c. &c.

AN

EXPOSITION

OF

THE PRACTICE OF AFFUSING COLD WATER ON THE SURFACE OF THE BODY,

AS A

REMEDY FOR THE CURE

OF

FEVER:

TO WHICH ARE ADDED,

REMARKS ON THE EFFECTS OF COLD DRINK, AND OF
GESTATION IN THE OPEN AIR IN CERTAIN
CONDITIONS OF THAT DISEASE.

BY ROBERT JACKSON, M.D.

EDINBURGH:
Printed by Abernethy & Walker,
FOR W. MARTIN, BELL & BRADFUTE, W. CREECH, P. HILL,
A. CONSTABLE & CO. W. LAING, GUTHRIE & TAIT,
W. BLACKWOOD, AND A. BLACK, EDINBURGH;
A. WILSON, AND BRASH & REID, GLASGOW;
AND JOHN MURRAY, LONDON.

1808.

159, 252

Charles P. Putnam M.D

June 2, 1874

PREFACE.

The following work has assumed a form, and grown into a magnitude which was not originally in the contemplation of its Author. In looking into the fourth edition of Dr Currie's Medical Reports on the Effects of Water, which came to my hands in summer 1806, I found that I was there charged with arrogating to myself the merit of introducing the practice of affusing cold water on the surface of the body as a remedy for the cure of fever; a discovery, which Dr Currie holds to be due to Dr Wright, whose name, he remarks, I had *unaccountably* omitted to mention *. Conscious of perfect fair dealing on this head, I could not permit the insinuation, obscurely expressed as it may be, to pass without notice; for, though it may be a matter of no importance to any one to know by whom the affusion of cold water was introduced into this country as a remedy for the cure of fever, it is a matter of importance to know that a person, who stands before the public as a counsellor on the subject of human health, standeth clear of all suspicion on the score of veracity and candour. Without evidence of the most scrupulous adherence to truth on every occasion, the informations and advice of a physician will not be credited; and if his informations be not credited, his advice will not be followed; consequently he will pass from the stage of life without being able to do good

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* Dr Wright, the person alluded to in this place, was a practitioner in Jamaica prior to the year 1777: he stands in the Army List as surgeon for the 99th regiment, which was raised at a late period of the American war, and, I believe, sent to serve in the West Indies: he was appointed physician to the forces in the year 1795; and, he lately filled the president's chair at the Royal College of Physicians of Edin-

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burgh.—His claim to the discovery of affusing cold water on the surface is shortly this. Some buckets of cold sea water were dashed, at his own desire, upon his own person, while he suffered from fever during his passage from Jamaica to England in the year 1777. He published a statement of the fact in a periodical journal in the year 1786; but he did not then inform the public that he had repeated the experiment in the interval of nine years, between 1777 and 1786. If the experiment was not repeated in so long an interval, where we must suppose, from his official station, that opportunities for prosecuting the practice abounded, we cannot admit that he made a discovery; for, according to a just view of the subject, a medical discovery comprehends something more than a solitary experiment.

in his sphere, and, as such, he might as well not be born. The suspicion, which has been insinuated by the Author of the Medical Reports, and more boldly pronounced by the Editor of the Edinburgh Review regarding my pretension to the early employment of cold bathing as a remedy for the cure of fever, occasions this remark. It may in fact be considered as the more direct cause which produced the following volume; for, unwilling to lie under the imputation of having acted disingenuously, I bethought me of stating the case as it actually is in a small pamphlet, or in some one of the periodical journals. Such in fact was my intention; but when I came to consider the matter more deliberately, as I observed that Dr Currie, not only expressed himself ambiguously on the score of my pretension, but that he endeavoured to controvert the grounds of the principle according to which I acted, judging it to be erroneous, consequently concluding the effect to be imperfect or unfortunate, I entered into the subject at large, and have now given a form to my work different from what I had originally designed. For, circumstanced as I am, I consider it to be a duty which I owe to myself to substantiate the truth of my claim as a matter of historical fact; I even hold it to be a duty which I owe to the station which I have held in the public service, to produce evidence that my principle has not been applied injuriously in practice upon those who were committed to my care; and, moreover, as my writings are still before the world, I think it due to the world that I vindicate them from the imputation of leading any one into error who may be disposed to consult them with a view to information.

The practice of affusing cold water on the surface of the febrile subject is not entirely new to the British public. It was noticed by myself in the year 1791, in a treatise which I published on the Fevers of Jamaica in that year; but it was then noticed only among other remedies, and, as such, it did not attract particular attention. It has been noticed in a different manner since that time, and it appears now to be viewed in a highly important light. The late Dr Currie of Liverpool wrote professedly upon the effects of cold water in the year 1797; and he then treated the subject in such a manner that the knowledge of it became generally diffused. He also soon thereafter solicited the medical world to communicate with him concerning the results of their experience on this head; and, as his solicitations met with regard, the practice appears to have been elucidated and confirmed by the authority of communications which were then imparted to him, and which are found in the second volume of the Medical Reports. If the principle, assumed by the author to whom this practice owes its present elevation, were founded on demonstrative evidence, even if experience presented no contradiction to its truth, the work which I now submit to the consideration of the reader would be superfluous at the best: it would even be worse than superfluous, in as much as it goes to substitute a rule, which is intricate and not easily apprehended, for one that is obvious to every one, and precise in its character. The principle, or condition which forms the base by which my practical act is regulated, is not and cannot be made obvious to the apprehension of the multitude. The means of ascertaining its existence are not in fact easily attained even by the intelligent, and they are open only to men of professional science, who have intimate knowledge of the laws and movements of animal economy in all its varieties. On the contrary, the principle or primary condition assumed by Dr Currie, as depending simply upon high temperature, is obvious to any one; and, as high temperature comprehends this condition, his practical act, as regulated by a guide so little liable to err as the scale of a thermometer, is supposed to be adjusted with almost mathematical precision. The condition assumed in the Medical Reports I admit to be a plain one—of easy apprehension. If it were comprehensive so as to embrace the whole circle of febrile disease, and if the practical rule founded thereon presented no contradiction within itself, I would have had no pretext for writing, and, if I had written before I was so enlightened, my conscience would command me to commit what I had written to the flames; for I frankly acknowledge that I am not able, after all my labour, to produce a rule to regulate the conduct of the physician on the point of applying cold water to the surface, so precise and confident as that delivered in the work alluded to. The aspect of precision strikes strongly at first sight, and gives flattering hopes of perfect success in practice. The rule is notwithstanding vague; and disappointment occurs frequently, when the case is examined correctly and judged according to the evidence of experience. It does not in fact apply uniformly every where; and this it ought to do, if it were founded on a true base. For example, if we trace fever through the whole extent of its circle we find numerous instances in its history, where Dr Currie's principle, or base of action, viz. increased heat, does not present itself in any measureable degree; consequently where no benefit can be expected to accrue from the application of cold water to the surface consistently with his doctrine: hence his rule is limited. But, besides this narrow limit of the rule, experience furnishes instances—and they are not rare, where the heat is higher than natural according to the indication of a thermometer, or according to the sensation of a person in health—without comprehending in its character that particular condition in the diseased habit under which the affusion of cold water on the surface produces permanent benefit;—there are in fact some of these instances where it cannot be applied with safety; some where it produces no material effect; and others, where it appears to subtract or diminish the increased heat, but where it leaves the febrile action still subsisting: here this rule is fallacious. It happens also—and not rarely—that affusion or aspersion of the surface with cold water is eminently serviceable where no increase of heat is discoverable in the subject, even where it is palpably defective. Here we are restrained by the theoretical interdict of the Medical Reports from pursuing a practice which experience proves to be safe and salutary: in this case, the rule is injurious. If what I now state be correct, the condition of increased heat, or high temperature, is not the paramount condition on which the physician ought to fix his eye, as a point for regulating his judgment in forming opinion respecting the character of fever; and, by necessary consequence, the scale of the thermometer is not to be considered as the guide which ought to direct his act in applying the remedy or means of cure. Assured of this fact by evidence that cannot be doubted, I have endeavoured to investigate the subject with minute attention, for the purpose of discovering the ground or base on which the affusion of cold water on the surface acts successfully :—the base is one, uniform and consistent: the anomalies, though numerous, are the product of contingency.

Such is the cause which prompted me to this undertaking, and such the rule which guided me in the prosecution of the task. I commit it to a discerning public for judgment, not soliciting indulgence for its errors or imperfections; on the contrary, desirous that it may be examined with rigour and judged according to its merits; for, as a medical tract, truth and utility alone must be its patron. The narrative of fact is faithful: the language, I am ready to acknowledge, is harsh and rugged; but I am inclined to believe that it will not be found to be ambiguous and obscure. I have aimed at no other ornament in composition but to express my meaning with clearness and precision. If I have attained that, I have attained my object.

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EXPOSITION
OF
THE PRACTICE
OF
COLD BATHING,
&c.

PART I.

A SHORT HISTORY OF THE INTRODUCTION OF COLD BATHING INTO MEDICAL PRACTICE, AS A REMEDY FOR THE CURE OF FEVER.

First introduction of cold affusion as a remedy in fever.

THE affusion of cold water on the surface of the naked body has been known as a remedy for the cure of fever since the time of the Roman Emperor Augustus *. The success which followed the application of it in the person of Augustus far exceeded expectation. It appeared to have saved the Emperor's life; and the opinion enter-

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* Though the first instance of the general affusion of cold water, as a remedy for the cure of fever, is admitted to be the experiment of Antonius Musa with the Emperor Augustus; yet the writings of Hippocrates sufficiently testify that the partial application of it was not unknown or unpractised at an earlier era. *Hipp. Oper. Edit. t. 83, p. 518.*

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tained of its value made, on that account, great impression at the Roman court. But, as the application of it was here an experiment made at random, the subsequent trials, it may be presumed, were often made through fashion, and sometimes probably made in circumstances not favourable to success. Hence it was liable to fail, and it actually failed in the case of the young Marcellus, who was the hope of the crown, and a favourite with the Roman people. In consequence of its failure in a case to which it was not perhaps properly applied, it appears to have been banished from the circle of the Roman court; but we cannot thence conclude that it was banished from every part of the Roman empire. The experience of its benefits at least were not forgotten; for we find that Charmis, a physician of Marseilles, not only renewed the practice some time after, but re-introduced it at Rome with great *eclat*[*], where it was fully established in the time of Galen, who conducted the practical application of it with great elegance, and, according to his own account, obtained from it singular good effects.

The practice of affusing cold water on the surface ranks high among the remedies, employed for the cure of fever by the physicians of the east. History ascertains the fact: but at what time, or by what means the knowledge of the remedy was conveyed to these regions, is not known with certainty. Whether it was introduced by the physicians who went to the court of Sapores in the train of Aurelian's daughter, and who were sent expressly on purpose to instruct the Persians in medical science[*], whether, by the writings of the Greek physicians which were translated into the Arabic language at an early period of the Khaliphat, or, whether it arose among the Asiatics themselves, as a result of their own observation, is a matter which cannot be ascertained with any precision, and it is not of any great importance to be inquired into. But, be the history of its introduction into the eastern countries what it may, it is evident from the relations of travellers, more particularly from the testimonies of Chardin[†], Bruce[‡], and Busbeck[||], that it is still employed as a remedy, often as a last resource, in dangerous fevers, in Persia Proper, in Africa, and in Asia Minor.

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[*] Plin. Histor. Natur. lib. xxix. c. 5.

Cold bathing holds a conspicuous place as a remedy for the cure of fever in the works of the latter Greek physicians, particularly of Galen; and, on that account, it is somewhat surprising that it was not introduced into civilized Europe at the revival of letters, among the other practices of the Greek school. Cold drink appears to have been a remedy of great dependence on the shores of the Mediterranean in times past; but the affusion of cold water on the surface does not appear to have had the sanction of medical authority during the last century, in any part of Europe: cold drink was interdicted in some, and cold air was admitted into the apartments of the sick with great circumspection in most. It is true indeed that instances sometimes occurred, where salutary effects followed the application of cold water to the surface; but they were accidental, and, though they were recorded by practitioners, they do not appear to have been rightly understood *. It is only of late that the remedy has been tried fairly and appreciated according to its merits. The army, navy, and public charities have furnished the opportunities of making experiment, and of ascertaining its benefits. These have been proved incontestibly on the bodies of British soldiers and British sailors, and on the subjects of hospitals and dispensaries; but it is little known

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[*] Abulpharage's History of Dynasties (Arab), Oxford, p. 129.

[†] Chardin's Travels.

[‡] Bruce's Travels.

[||] Busbequi iter Contantinopolitanum, Antwerpiæ, 1582.

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* Barnard.

in this country beyond that circle. It is thus as yet a remedy of the vulgar; but, as it is a remedy of great power, and, as its impressions are often grateful to sensation while they are powerful in arresting disease, it is not presuming extravagantly to suppose that it will soon be translated to a higher sphere than a military hospital, or the precincts of a poor-house, unless its simplicity and the decision of its effects should be found to stand in the way of its progress.

The author's first trials of it.

I myself *, as appears by histories detailed in my treatise on the Fevers of Jamaica published in the year 1791, employed cold bathing as a remedy for the cure of fever as early as the year 1774; and facts which are commonly known shew, that I introduced it into the hospitals of the British army at an early period of the war 1793. If the practice was known to some at that time, it was not yet commonly adopted. In my treatise on the Fevers of Jamaica which was published in the year 1791, it is probable I may appear to arrogate to myself more of the claim of introducing the practice into notice than is justly my due; for I now know, what men acquainted with books knew then, that sponging or washing the body

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* Treatise on the Fevers of Jamaica, published 1791, Notes, p. 48, &c.

with cold water was employed by De Hahn for the cure of a malignant fever which ravaged Silesia in the year 1737. The remedy is mentioned by De Hahn in terms of strong commendation; but there are no grounds to believe that it obtained currency among medical practitioners in Germany, in consequence of what he said in its praise. The practice in fact does not appear to have made progress in Germany; and it was not recommended by any name of eminence in the British dominions in the year 1774, when I was led to bring an accidental suggestion to the test of experiment. The hint which led to this experiment was drawn from the conversation of Captain Cunningham, a seafaring man, who had been master of a transport ship at the siege of Havannah, and who was master of a merchant ship in 1774. I embarked with him as passenger for Jamaica in the beginning of the above-mentioned year, and I recollect his having mentioned one day during the passage, when discoursing of the events of the war of 1756, the circumstance which I have related in my treatise on the Fevers of Jamaica respecting this subject, viz. that some sick persons who were on board of his ship, which appeared to have been a kind of hospital ship, threw themselves into the sea,—as if to drown themselves. The greater part of them, he observed, were recovered from the waves, and, as far as he recollected, they were restored to their senses, and benefited in their health by the ducking. The fact struck me strongly as applicable to the cure of fever; and, in consequence of this impression, I resolved to make trial of a similar experiment when a favourable opportunity should offer to me. This in fact soon presented itself, viz. in the latter end of May of the same year, in the person of a sailor, an European, lately arrived at Savanna la Mar, where I resided. This is the simple state of the case. I do not perceive that it is connected with circumstances which can afford any just grounds for the most scrupulous to suspect that it is not true; yet I have to remark that some have insinuated obscurely *, and others have asserted roundly that its authenticity is doubtful †.

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* Medical Reports, vol. ii. p. 198: " *He*" *(Dr Jackson)* " *has unaccountably omitted to mention Dr Wright's name and discovery, which was before the public five years prior to the publication of his Treatise on the Fevers of Jamaica.*"

† Edinburgh Critical Journal, April 1804.—This journalist observes, that " *if he (Dr Jackson) employed the cold affusion so early as he pretends, the details of its effects do not, in all probability, redound very much to his credit; and these he has accordingly very prudently suppressed.*" The assertion is not true; the details of the practice, and its effects, are given at length in the book above alluded to; but it would be an insult to the public to take any further notice of the suspicions of this journalist, who appears to regard nothing less than truth and candour.

If these or others expect legal proof, by the depositions of ocular witnesses, that I actually employed cold bathing for the cure of fever at the period stated in my treatise on the Fevers of Jamaica, I must confess that I cannot furnish them with such satisfaction; for it is more than probable that no ocular witness of the first experiment, and even of the subsequent repetitions of the practice during the period of my residence in that island, is now among the living. But though I cannot promise the satisfaction on this head that such persons may require, I believe the subjoined certificate from Dr Gregory*, Professor of Medicine in the University of Edinburgh, a person whom the Editor of the Edinburgh Review himself will not suspect of collusion in the case, will be deemed conclusive evidence, in the opinion of most, that the remedy in question was recommended by me, and it may thence be presumed was employed by

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* The fragment in Dr Gregory's possession is an abstract from fuller notes made at different times respecting the history and cure of the fevers of Jamaica, and it may be supposed to comprehend the sum of my experience on the subject at the time it was written. I did not know of its existence till the year 1798, when it was presented to me by Dr Gregory. I thought it had been lost among some other papers which were lost in America; but I now find that it had been given to Dr Cullen, or rather to Dr Henry Cullen, not by myself, but by a person with whom I left it when I went to the continent in the year 1782*. The circumstance escaped his memory when I returned, and it did not come into my own

* That it was in Dr Cullen's possession, I conclude from his having mentioned my opinions on the fevers of Jamaica in his class in the year 1787 or 1788.

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recollection till lately. The fragment alluded to may thus be supposed to have been in Dr Cullen's library at the time of his death, after which it, by some chance or other, came into the hands of a medical gentleman in Edinburgh, who gave it to Dr Gregory, on hearing the Doctor refer in his class to some observations made by me on the connection of the moon with fevers, which were communicated to Sir Joseph Banks, to the best of my recollection, in the year 1787 or 1788. Such is the history of this fragment: it is now in the possession of Dr Gregory, who has obligingly desired such passages as relate to cold bathing to be transcribed for my satisfaction. These, as private notes not intended to see the light, may be held to be satisfactory proof that I had witnessed the good effects of cold bathing in different forms of fever; and while they do this, they prove at the same time, that I did not consider it as a practice to be employed indiscriminately, or that I expected uniform success from it, without caution and previous preparation of subject. Its effects are first noticed in *remittent fevers.*—" In order to remove a topical pain, the evacuation (venesection) ought to be made as quick as possible; and it would be proper at the same time to place the patient *in semicupio*, and perhaps to apply cold, to dash cold water on the part from which we wanted to dislodge the pain, particularly if the cold could be brought to act on the part, as in the particular instance of topical affection of the head." Page 44.

Malignant Fever.—" The warm and cold baths, generous wines, lively conversation, and music, if they are applied with judgment," &c. Page 55.

Continued Fever.—It is an object of greater moment, if we know how to stop the progress of the disease at once, or to change its nature from dangerous to mild, and from continued to remittent. The cold bath, properly managed, promises fairly me at a date prior to the appearance of Dr Wright's narrative, probably prior to the existence of his experience; for the fragment from

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to attain this end. In the few cases where I have seen it tried, it produced the most amazing effects. It promoted sweat, procured rest, and gave such strength and vigour to the system, that a patient who before it was applied could not raise his head from the pillow without shaking and fainting, was able next day to walk all about the room. In a word, it seems to be a remedy fit to do every thing that is wanted in this case, if the sensibility of the system be not very much impaired, and even then more may be expected from it than from any other we know. The water that was used was from the sea, and had a large proportion of salt dissolved in it. This is more particularly proper, where the sensibility is impaired. The warm bath too may sometimes be of signal use, particularly the alternate application of this and of the cold bath; but it requires great judgment to use them with full advantage; at the same time they appear to be in general innocent." Page 63.

Yellow Fever.—" For all those purposes the cold bath, particularly if a large portion of salt be dissolved in the water, is a most capital remedy. If the sensibility is not much impaired, we may expect to attain our end with certainty. If the sensibility is very much impaired, it is certainly doubtful, though it promises more than any thing I know. There are a great many circumstances, however, which must go along with the use of it, in order to give it full power, and every advantage, particularly the prudent use of the warm bath and of wine," &c. Page 69.

Transcribed by Mr John Thomson from a fragment of Dr Jackson's original papers, which have been long in my possession, and forwarded by me to Dr William Robertson of Bath.

(Signed) J. GREGORY.

Edinburgh,
24th October 1807 }

which the extract is made was written in Jamaica, and necessarily written not later than the year 1777, as I left the West Indies early in 1778 to serve with the King's troops in America. The narrative by Dr Wright, which forms the groundwork of Dr Currie's volumes on the effects of water, made its appearance in the year 1786; my treatise on the Fevers of Jamaica was not published till the year 1791, consequently I might have known of it; but it does not follow, as the Editor of the Edinburgh Review arrogantly pronounces, "that I could not be, or ought not to have been ignorant of it." I might address similar language to others; but it is not language to be addressed to a gentleman. My treatise on the Fevers of Jamaica was published in the year 1791. It contained stronger commendation and fuller proof of the benefits of cold affusion in certain circumstances of fever than any modern book then extant. It was reviewed in most of the periodical journals of the time, and it did not perhaps stand lower in their estimation than the narrative of Dr Wright, which is now held to be so important. This is the fact; yet, I do not therefore say or insinuate that Dr Currie acted unaccountably or disingenuously in not referring to it in the work which he published in 1797, six years after it made its appearance; I only contend that, as Dr Currie derived no hints of information from my treatise of 1791, my claim to credence is not inferior, when I aver that I derived nothing from Dr Wright's narrative of 1786. The fact is, I did not know of it; and if I did not know of it, it is plain I could not notice it. That is clear; but I now add, that had I then been acquainted with it, and taken all the light from it which it can be supposed to give, the task of making a book from such meagre materials, without some experience of my own, would have far exceeded my abilities. The instance of the success is solitary, or next to solitary; and when I see that its author, whom I allow to be a zealous physician, made no use of his discovery in the period of the nine years intervening between 1777 and 1786, though we are given to understand by the author of the Medical Reports that he had been in a foreign country in the interval, and, it would further appear, employed in some station of public service where he could not be supposed to be without opportunities, indeed where occasions must have necessarily abounded which called for the most powerful aids of the medical art, the narrative sinks to the bare record of a fact; which, however important in itself, led to no consequences in the hands of its recorder, and cannot therefore be fairly supposed to be calculated to form a basis on which another could establish a system of practice.

Author's offer of service.

The history which I have now given, together with its evidences still existing, and to which I have referred, may be considered as decisive proof that I recommended, and it is to be presumed actually employed, cold bathing as a remedy for the cure of fever in the West Indies prior to the year 1786; but while I thus substantiate the fact by evidence that cannot be fairly doubted, I must at the same time confess that I did not so well understand the various modes of preparing the subject, previously to the application of the water, in these early years as I do at present; nor had I then so well digested the rules according to which the process is to be conducted, so as to insure the full benefit of the effect, as I have done since. The investigation of fever, I may observe in this place, had by some chance or other attracted more of my attention, and occupied more of my thought, than that of any other disease to which man is liable. Considering the subject to be an important one, I was desirous of prosecuting the study of it in a larger field of experience than can be supposed to fall to the lot of a physician in civil life; I therefore offered service as army physician for a foreign station, expressly for the West Indies, soon after the commencement of the war 1793. I had believed that the public evidence, which I had given of my acquaintance with the fevers of tropical climates, would have been considered as a sufficient recommendation for the appointment in question: on this head I was mistaken. A primary condition of qualification for army physician consisted, at the time stated, in having served in the capacity, or rather in having borne the commission of regimental surgeon, staff surgeon, or apothecary to the forces. I had considered myself to be qualified in effect by having served with the King's troops in a medical capacity, both in Jamaica and in America; in fact, in having done the duty of regimental surgeon for some time, though I had not ostensibly borne a surgeon's commission. The letter, not the spirit of the regulation was followed; and I, of course, was not eligible according to the letter. Chagrined at this disappointment, for the study of fever in a tropical climate had been long my favourite object of pursuit, I made my offer in another form, representing my readiness and willingness to undertake the office of surgeon for a regiment destined to the West Indies, under the implied condition of attaining the physician's rank on the first proper occasion. The Third Regiment of Foot or Buff, then embarked for the West Indies, and lying at Spithead ready to sail, was immediately offered: I accepted it without hesitation, joined it November, and, from that time forward, the rule of previously preparing the subject and of regulating the application of cold water to the surface, as a remedy for the cure of fever, as it had long attracted my notice, now engaged my particular attention. The field was free and uncontrolled; and I am encouraged to believe, that I have been enabled, through this experience, to place the management of cold affusion on a scientific base:—I now so far encroach on the reader's patience as to give a summary view of the steps of its progress in my hands.

Author's experience posterior to 1793.

The Buff, like many other infantry regiments of the line, received a draft of recruits at the commencement of the late war from the newly raised independent companies*, and it suffered, in common with others, from the ravages of an infectious fever. This disease, simple and easy of cure in its own nature, was aggravated by accumulation in transport ships or ill-ventilated quarters; the usual means of cure were also opposed or rendered abortive by deficiency of accommodation for the sick. The Buff, crowded in transports beyond a just proportion, was sickly while on board; it was disembarked at Lymington, and it continued sickly in its crowded quarters on shore. It was again re-embarked and conveyed to Jersey for a purpose of exigent service, though its sick-list was still high. The affusion of cold water was here employed occasionally; not, it is to be observed, in all cases. The effect was favourable; for, out of upwards of one hundred cases of genuine fever which were received into the hospital between the month of November and the end of July, only one man died, and he had been overlooked during the three first days of the disease. The Buff arrived at Jersey in the month of March with a numerous list of sick. It occupied the barracks at St Helier for about six weeks, and the sick-list still continued high. It encamped early in May at Grosville Bay near Fort Henry, on a dry and sandy soil. The change in the state of health was sudden and remarkable; in so much that before the middle of June there did not exist a single instance of fever or other acute disease in the corps. Here every person bathed in the sea at least three times a-week, and the younger soldiers spent much of their time in athletic sports and pastimes on the beach.

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* See Outline of the History and Cure of Fever published at Edinburgh in the year 1798.

During the time the Buff remained in Jersey (summer 1794), a number of recruits were collected at that station, which was fixed upon as a depot for organizing and disciplining the new levies previously to embarkation for foreign service. This heterogeneous mass suffered much from sickness, and it lost a great number of men,—the disease, the common infectious fever of jails, hospitals, and crowded quarters. The medical charge was in the hands of two hospital-mates,—Parker and Nicolay. These gentlemen, who were then young in the service, were embarrassed in their situation, and distressed at the extent of the mortality which prevailed among the persons committed to their care. I recollect to have communicated with them on the subject, and to have mentioned to them the benefits which were reasonably to be expected from the affusion of cold water on the surface, but I do not recollect whether the means here recommended were adopted by them or not; or, if adopted, to what extent they were carried. The 88th regiment arrived in Jersey early in summer 1794; and, like most of the new corps, it suffered severely from sickness. The surgeon of it, Mr M'Gregor, who is known to the readers of the Medical Reports as a correspondent of Dr Currie, and who is also an author on his own ground, notices, in his Medical Sketches, the cause through which cold bathing was introduced into the hospital of the 88th, as a remedy for the cure of a fever which was then destructive in that corps *.

The Buff arrived at Bergen-op-Zoom in Holland in the beginning of August 1794 in a state of the highest possible health; but it soon experienced a reverse. A fever, apparently of an infectious character, insinuated itself into the regiment before the beginning of October, and it eventually spread so wide in the following months, as to infect almost every individual in the corps, commissioned military officers excepted; these, not being drawn by duty to hold intercourse with the sick, suffered in no proportion with the others. It is yet fresh in our memory that the cold of the end of the year 1794 and the beginning of 1795 was of unusual severity; and perhaps it is also remembered by some that many of the regiments, which composed the British army in this campaign, were badly clothed, scantily provided with necessaries, and generally destitute of extra bed-

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* The fact is shortly this: Mr M'Gregor was himself attacked with the fever, and the assistant-surgeon of the Buff was directed to attend the hospital of the 88th regiment during Mr M'Gregor's illness. This gentleman, Mr Thompson, employed the cold affusion in the hospital of the 88th, for he saw it ordinarily employed in his own regiment: M'Gregor acknowledges the practice to have been serviceable. Medical Sketches, p. 237.

ding for the regimental hospital. The troops were encamped or hutted near their posts; and the sick were usually accommodated in neighbouring barns, where there was of course neither fire-place nor stove. This was the general condition: it was not a favourable one for the cure of disease, or the subsequent recovery of health; and it is evident that medical aids must in such case be applied under disadvantages. Affusion of cold water on the naked surface, under the intense cold which then existed, would probably be deemed by many to be a barbarous or dangerous practice, and the circumstances apparently connected with the subject were certainly forbidding; yet I persisted in my usual course, and I can safely say that I did so with benefit to those who were placed under my care. The experiment was bold, and it may not be improper to mention the mode according to which it was conducted. The patient was, in the first place, washed and made perfectly clean by means of soap and warm water; the skin was rubbed strongly, and, under the state of susceptibility and artificial animation consequent to friction, cold water was poured upon the head, shoulders, and other parts of the body from a bucket; or it was applied by means of sponges in such manner as to imitate a shower bath. The intense coldness of the water, ordinarily at the freezing point or near it, superseded the necessity of quantity : the sponge was therefore generally preferred to the bucket; even slight aspersions were now often found to be sufficiently powerful to assure the desired purpose. An emetic was here given in many cases previously to the affusion of the cold water; but bleeding, unless where there were evident marks of local inflammation, was not employed, and purgatives were administered only where there were signs of abdominal congestion. The affusion was made early; sometimes it was the first remedy, and the result of the practice was fortunate: the course of the disease was frequently arrested precipitately, and though relapse occurred occasionally, for the cause always existed in the abodes of the soldier, the repetition of a similar process was followed very generally by a similar effect. There was little mortality,—only one in fact in one hundred and forty; and, while mortality was so inconsiderable, the strength of the sick was rarely impaired where the means stated were applied in the early periods of the disease. The general practice which I adopted with the sick of the Buff was, I believe, known to several army surgeons in this campaign;—I do not know that it was actually tried by any of them.

A division of troops, placed under the command of General Sir Ralph Abercromby in the year 1795 for the service of the West Indies, rendezvoused at the Cove of Cork in the month of October. It was detained in harbour, by contrary winds and other causes, till the month of February, and the circumstances of this division of the expedition afforded a very extensive field for observation on the subject of infectious fever. But it does not belong to this place to enter into a detail of its history: it is sufficient to remark that, where the sick were crowded together, heaped tier upon tier in barrack beds, or packed close to one another as they lay upon the floor on sacks of straw, as happened in Westmoreland Fort, which was converted to the purpose of an hospital, the mortality was prodigious. On the contrary, the loss was inconsiderable among those who were placed in the sheds which were constructed on the outside of the fort on the pressure of the occasion, or in the miserable hovels already existing, which were rented and occupied temporarily as hospitals for the sick. The difference of effect was striking. I may err in assigning the cause; but, in as far as I could judge, it was owing to the benefits of frequent ablution with cold water; for, as the sheds or hovels were placed near the sea-beach, and as the person* who undertook the medical care of this division believed in the virtues of cold water, the patients were washed or affused lavishly at admission, and occasionally at other times.

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* The Author.

This same practice of cold affusion, which appeared to be so salutary on Spike Island, was employed with great freedom and evidently with great benefit in the ship John, on the passage to the West Indies. The John was in some measure an hospital ship, allotted to carry the hospital corps and a certain proportion of convalescents to their destination. It is known to medical men that the condition of convalescence from infectious fever is always a precarious condition: relapse is common, and, according to circumstances, it is more or less aggravated than the original disease. The hospital corps was embarked in the John on the eve of sailing: the bodies, and even the clothes of most of the individuals of it, were then overcharged with infection; for they had acted as orderly, and they were brought to the John from the duty of attending the sick on shore, without being allowed time for purification. The sickness, as it manifested itself among them after embarkation, was of the most aggravated kind,—such as threatened unusual destruction, had it not been for the preventive measures now to be mentioned. The officer to whom the medical charge of this ship was intrusted became indisposed in about twelve days after we left the harbour. I was then on board. I assumed his duty, and I employed the affusion of cold water with great freedom, both in the early and in the advanced stages; and frequently in cases of relapse, for of these there was a great number. The process was conducted in the following manner: The subject was placed in a large bathing-tub half filled with warm or tepid water, to which was added some handfuls of oatmeal. By this addition the salt water was softened, so that the skin, when scrubbed with a brush, was easily cleansed from its impurities; and, while susceptible as clean, and glowing as excited by the scrubbing, some gallons of water drawn immediately from the sea were poured upon the head and shoulders from buckets, sometimes slowly, gently, and sparingly, sometimes dashed suddenly with force and in large quantity. The effect was pleasing, refreshing, and invigorating; the fever was diminished, often extinguished; and the patient, who had but a few minutes before been restless, perhaps highly delirious, was tranquillized and restored to the possession of his senses in an instant; or, if parched and withered, he was refreshed and animated in his own feelings, and visibly in the eye of others in the manner that a scorched and drooping plant is refreshed and enlivened by a shower of summer-rain. The countenance became cheerful, the eye expressed gratitude, and pleasure diffused itself through this otherwise melancholy scene.—It is unnecessary to say that a large portion of this pleasure fell to my own share, for I superintended the operation which produced the happy change.

Cold bathing appears by the reports of various persons to have been tried occasionally in the fevers of the West Indies previously to the year 1796; but I cannot speak with any certainty of the success of the experiment. I therefore proceed to state what I did myself in that country. But before I do this, it is proper that I inform the reader that the office which I held during my service in St Domingo, implying a superintendence of hospitals rather than a direct medical charge of any particular division of troops, I had not the opportunity of reaping all the advantage from the effects of cold affusion that I might have had, if I had done the duty of regimental surgeon, or even acted as physician to a general hospital. But while I had fewer opportunities, in consequence of the nature of my office, of acting decisively with cold water as a remedy for the cure of fever than I should have had in the other case, I was at the same time furnished with more numerous occasions of witnessing failures, and of ascertaining the conditions to which the remedy does not apply, than if I had been regimental surgeon, and treated the disease from the beginning after my own manner; for, in such case, I should hold myself culpable of neglect, or chargeable with error in judgment, if the disease had a protracted course, or if it degenerated into that condition which resists the salutary action of the cold affusion. This may perhaps seem to some to be language of too great confidence; but I am warranted to speak confidently on this head from fair testimonies of experience. I assumed the office, and exercised the function of regimental surgeon for the 56th regiment at the Mole, St Domingo, in the year 1796, for a period of six weeks. I did this with a view to ascertain what might be done by medical treatment in the so much dreaded fever of the West Indies; and I think I may say that it was fairly proved to me, by the results of this experience, that the disease is by no means unmanageable, if treated with decision in the beginning. The affusion of cold water was one of the great remedies in this case; but, I must observe at the same time, that its salutary effect was not to be depended upon, when it was applied indiscriminately to every condition of fever, even in the early stage. Experience has proved to me that a certain previous condition of system is required to give success to the effect; and, if this do not exist naturally, it is plain that it must be prepared artificially, the means varied according to circumstances. Bleeding was here the great preparative to the cold affusion, but a detail of the manner of conducting it does not belong to this place: it will appear in the third part of the work.

The Russian auxiliary force which served with the British army in Holland in the year 1799 was crowded into transport ships at the termination of the campaign, and ordered to proceed to Jersey and Guernsey as stations of winter cantonment. The weather was boisterous, and the passage was tedious. Sickness was the consequence,—the disease produced—such as arises by accumulating men in ships or barracks in damp and foggy weather. The medical superintendence of the Russian force was committed to my care; and the facts, which presented themselves to me in the course of this duty, served to enlarge my views on the subject of warm and cold bathing as a remedy for the cure of fever. The Russians, as is generally known, practise a form of bathing which is peculiar to themselves: they hold the customary practice and discipline of the bath to be essential to the preservation of their health and the support of their vigour: they languish when they are debarred the enjoyment of it: they are enlivened and rendered active by the use of it, in so much that the dull and squalid Russian becomes alert and gay after he has undergone this renovating process of national luxury. The custom seems at this present time to be peculiar to Russia: it was employed by the Russian troops as a means of gratifying animal sense, or with the idea of preserving health: it was not admitted by them among the list of remedies for the cure of fever. The basis of the Russian medical system is German; and as Germans, or persons who had received a German medical education, composed the majority of the surgeons who served with this detachment of the army, the transition from a hot to a cold bath was probably deemed too hazardous to be ranked among their curative means. It finds no sanction in the doctrines of the German medical school; and it was not in fact employed by the Russian surgeons for the cure of the disease. It was however recommended, and sometimes employed by myself and the British medical officers who acted with me on this occasion; and, though it was not employed as the sole or principal means by which fever was attacked, it was employed often enough to furnish proof of the perfect safety and the great advantage of the alternations of temperature produced by affusions of warm and cold water. I thus learned some useful lessons on this service concerning the form of preparation which renders the application of the cold water to the surface salutary and effectual, where it could not be expected to be so if applied simply to the case as naturally presented.

The Russian auxiliary force returned to its own country in summer 1800. My duty terminated for a time: it recommenced in the month of November following, when I was placed at Chatham in the situation of physician and head of the hospital for the army depot. The practice of warm and cold bathing, alternated in the same subject, was introduced as a common remedy for the cure of fever at the hospital of that establishment, and it was there applied more systematically and more extensively perhaps than at any other place in the British dominions. The benefits which resulted from the practice were great and evident,—visible to the eye of common observers; the proofs of which may be drawn from the effect, viz. the hospital returns, which were laid before the public in the year 1803 *. The accommodations for the sick, after the depot was transferred to the Isle of Wight, were inadequate to the purposes of the establishment; for besides the usual forms of infectious fever imported with recruits, or generated in barracks and aggravated by accumulation, sick-

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* Remarks on the Medical Constitution of the British Army by the Author, published in the year 1803, p. 128, and Table VII.

ness raged epidemically during the months of October, November, and December 1801; and it was of a highly malignant character: yet the sick returns, alluded to, shew clearly that the balance of success was decidedly in favour of the mode of practice then adopted;—and of this, warm and cold bathing formed a principal part. As this is proved by evidence which cannot be doubted, it must appear to the reader to be a striking, though it is not a singular instance of the caprice of medical opinion, that cold affusion for the cure of fever should be hailed as a discovery of great importance to the interests of the British army, and as such thrown under the protection of the Commander in Chief * in the year 1805, while it was represented, in the year 1801, by the present Physician-General † to the same Commander in Chief, as one of the dangerous and destructive practices of the author of this Exposition.

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* Dedication of the 4th edition of Dr Currie's Medical Reports.

† Remarks on the Medical Constitution, &c. p. 122.

PART II.

THE AUTHOR'S MANNER OF APPLYING COLD WATER TO THE SURFACE, PRIOR TO 1803, STATED AND VINDICATED FROM THE OBJECTIONS OF THE AUTHOR OF THE MEDICAL REPORTS.

I HAVE noticed cursorily the history of the first introduction of the practice of affusing cold water on the naked surface, as a remedy for the cure of fever; I have also noticed the means through which the subject was brought under my own observation, and I have detailed the steps of its progress in my own hands at considerable length, in the preceding pages of this work. This task I should not have undertaken or thought necessary to touch, had I not been in a manner compelled to it by an insinuation thrown out in the Medical Reports and Edinburgh Review, that I had arrogated to myself that which belongs to another. However irksome this part of the work has been to myself, and however little interesting it may be to many, I could not avoid going through with it;

for it was first of all necessary to establish my own character of veracity on solid foundations, before I assumed the office of imparting information to others. This I believe I have done satisfactorily. I shall now proceed to another part of the undertaking, which is the vindication of my rule of practice from the errors imputed to it by the author of the Medical Reports. I here however premise that I am sensible, I have not always expressed my meaning with precision, on the subject of cold bathing, in my treatise on the Fevers of Jamaica. Cold bathing is there mentioned as a remedy for the cure of the disease, but it is there only mentioned among others: it is not sole and sovereign, as it is held to be in the Medical Reports; it therefore strikes with comparatively little impression. I see this plainly; and I also see that I erred, if my object had been to attract attention, in not condensing what I had to say upon the subject into one point of view; for my remarks, as scattered and dispersed in different parts of the work, are liable to be overlooked, or to be mixed and misplaced in the imagination of the reader, and thus to be obscured. This has actually been done by the person who has taken the trouble to comment upon my writings.

Vindication of the author's publications.

Vindication of the treatise on the Fevers of Jamaica 1791.

Dr Currie *, in proceeding to remark on that part of my publication on fever which relates to the affusion of cold water, observes that I was led to employ it "*by hearing of the sudden and extraordinary recovery which had occurred in the case of some seamen, who, in the delirium of fever, had thrown themselves into the sea at the Havannah. This, he informs us, was communicated to him while he resided in Jamaica, so early as* 1774." This paragraph is not quoted correctly: the inaccuracy is of no consequence in itself; but it gives reason to conclude that my book has been very carelessly perused by its commentator. The hint, as I have already shewn, was suggested to me while I was on the passage to Jamaica; and, as far as I recollect, for I have not the book by me at present, the subjects who made the experiment were soldiers in a transport ship. The Doctor proceeds and pronounces, "*It does not appear, however, that he (Dr Jackson) adopted fully this bold practice either in form or substance. He used the method of affusion, but as it should seem partially, on the head and shoulders only.*" That the ground on which this sentence rests may be exhibited in a fair light, I must so far encroach on the reader's time and patience as to bring, into a continued detail, the various observations respecting the powers of cold affusion and the rules for managing its application, which are to be found in different parts of my work as adapted to the different forms of fever which I have there described. I observe for instance at page 215. of the treatise on the Fevers of Jamaica that, "*the alternate use of warm and cold bathing occasions great changes in the state of the constitution; and, from the trials which I have made of these applications, I do not entertain a doubt that they may be so managed as to shorten very materially the duration of fevers. I do not however promise, that they are capable of being so conducted as infallibly to stop the disease in its progress.*" This opinion was published in the year 1791, and apparently formed not later than 1777, the latest period of my service in Jamaica. I have now more experience of the powers of cold bathing in fevers than I had then, and I am enabled to speak with more confidence of the success with which it may be employed. I may however be allowed to say that, what is here stated cannot be considered as a doubtful or timid expression of my opinion concerning the sum of its virtues. Again at page 226. "*No person will perhaps refuse assent to the method of proceeding which I have hitherto recommended; but when I mention a free and bold use*

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* Medical Reports, vol. ii. p. 196.

of cold bathing, even at an early stage of this fever, I do not expect the same concession. To dash cold water on the head and shoulders of a person in fever, has an appearance of rashness and hazard. I can however produce the testimony of repeated experience for the safety of the practice, no less than for its success in procuring remission. Wherever it was tried, a calm and equable perspiration, additional tone and vigour, with great abatement of irritability, were constantly observed to ensue." It may be inferred, from what is here stated, that it was my ordinary practice to employ the affusion at an early period of the fever of Jamaica; which, in the district where I resided, was genuinely a fever of the remitting type. It is also evident from the effect consequent to its application that it was applied in the aggravated state of the paroxysm; and, as may be reasonably supposed, for the most part, with the presence of increased heat. At page 227: "*Cold bathing with salt water was of all others the remedy of the most powerful effect. I do not pretend to say that it absolutely stopped the course of the disease; but I can say with truth that it generally restored the distinction of paroxysm and remission, diminished irritability, and imparted a degree of tone and vigour to the system which was justly considered as a sign of safety."* The condition of fever, here alluded to, is that which is usually termed nervous. The irritability of animal action, particularly the locomotive, forms the prominent feature of the disease. The patient rarely bears a change of posture without fainting, or without manifesting a strong disposition to faint: the heat is seldom increased preternaturally,—it is frequently palpably diminished. Such circumstances, it is almost unnecessary to add, occur less frequently in the early than in the latter period of fever; consequently, the case here presented is less disposed to terminate abruptly with the application of this or any other powerful remedy, than where the course is less advanced, and the disease, as it were, less firmly established. At page 229: "*Cold bathing is the remedy on which we must principally depend. There are others which do good occasionally, but this is the only one I know which has any very considerable effect in changing the nature of the disease. Employed with timidity, it failed in doing good in some instances: I met with no example where the boldest use of it did harm.*" And at page 240: "*The principal dependence was then constantly placed in the cold salt-water bath, which, if well managed, produced most astonishing effects. An additional quantity of salt was often added to the water of the sea, and care was taken that the cold should be as* *great as the circumstances of the climate would permit.*" This relates to the application of cold water as a remedy for the cure of the fever which manifests signs of a gangrenous or putrescent tendency; a form, in which I consider bleeding as a necessary part of the previous preparation; and in which I recommend the affusion to be made with force and in quantity, if it be the intention to arrest the course of the disease precipitately,—not merely to moderate its symptoms and ameliorate its condition. At page 268: "*Bleeding having been premised in such quantity as was deemed proper, the patient was washed clean and bathed in warm water, in as complete a manner as the circumstances of the situation would permit. It is almost unnecessary to mention, that this was done with a view to increase mobility of system, and to remove spasmodic stricture from the extreme vessels of the surface; in consequence of which effect, greater benefit was expected from the application of cold salt water, which was dashed suddenly from a bucket on the head and shoulders. This practice may appear hazardous to those who argue without experience; but I can vouch for its safety and bear testimony to its good effects. Sweat, with perfect relief from all the feelings of anxiety and distress, was generally the consequence of this mode of treatment. If employed within* *the first* TWELVE HOURS *from the attack, it seldom failed of removing all the symptoms of danger, or of effecting a total and complete change in the nature and circumstances of the disease. If the progress was more advanced, though the same rule of practice might still be proper, the execution required more boldness and decision. It is only possible to judge, from the circumstances of the case at this period, of the necessity or propriety of bleeding or of emptying the lower intestines by means of glysters; but, when this business shall have been accomplished in such a manner as may be deemed right or conducive to the main view, it will be advisable to shave the head, to bathe the whole body in warm water, and instantly to dash cold water from a bucket on the head and shoulders.*" This paragraph relates to the external application of cold water as a remedy for the cure of the first, or concentrated form of the disease usually termed *yellow fever*,—the form most commonly manifested in the persons of robust Europeans newly imported into tropical climates. At page 278: "*The principal trust was placed in warm and cold bathing, which, under proper management, seldom failed of answering every expectation completely. It speedily removed the chief symptoms of danger; sometimes it appeared to cut short the course of the disease abruptly.*" This observation relates to that form of disease which I have described in the treatise above named as a second species of the *yellow fever*,—a disease of a comparatively mild character; where the application of the means stated makes a sensible impression without previous preparation of condition, and where it generally produces a fortunate effect in consequence of the impression so made. And, lastly, at p. 283: "*After the surface of the body had been sufficiently relaxed by the previous use of warm bathing and fomentations, the effects of cold bathing were wonderful: the excessive irritability was moderated or removed, the powers of life invigorated in a very singular manner in consequence.*" This remark relates to the application of the remedy in the third species of the *yellow fever*, characterized by irritations, tumultuous muscular action or spasms, rather than by torpor, or extraordinary excitement of the vascular system.

The above paragraphs, which are extracted from the text of my treatise on the Fevers of Jamaica, will, it is believed, serve to convince every unprejudiced reader that I employed the remedy in question at the time stated, and that I did not then employ it in a limited or partial manner. The water was affused upon the head and shoulders by means of buckets. This I consider to be an effective mode, not deficient either in form or substance, and not partial; at least I have not discovered, not even from the Medical Reports, how affusion can be rendered more general than by the practice which I adopted. If not partial, it cannot well be said to have been limited, for it was employed in all the forms under which fever presented itself to me during my residence in Jamaica. Some cases are detailed in the notes, and they are there given as examples of those forms of disease to which the remedy may be applied with safety, and with expectation of doing good. I am willing to confess that they are not so fully and clearly described as they ought to have been; but I believe at the same time that they are so far discriminated that those persons, who are acquainted with fevers in hot climates, will not be at a loss to discern the character of the disease, and to appreciate the condition which sanctions the use of the remedy, and warrants the safety of its application in circumstances of great apparent delicacy.—The first experiment made with this remedy was made on the person of a sailor, who was on board of a vessel lying in the bay. "He had been ill two days; the delirium ran high; the eyes were red and inflamed; the respiration hurried,—with anxiety and a high degree of restlessness; whilst, together with these marks of excitement, there were occasional indications of languor and a disposition to faint. The skin was dirty, which furnished an ostensible excuse for trying cold bathing; but, from the state in which things were, it was thought proper previously to draw some blood from the arm. This being done, some buckets of salt water were then dashed on the shoulders. He was laid in bed; a copious sweat ensued, succeeded by a distinct remission and total change in the nature of the symptoms." This case is to be viewed as an example of fever in the first stage of its progress: the symptoms of the paroxysm ran high, but they exhibited no marks of malignity. The favourable condition was not supposed to exist in the actual circumstances of the case; it was therefore prepared by bleeding, and it was prepared so fortunately that the effect of the remedy was decisive of cure. To this is added another of a different character: "A person had been ill of fever for six or seven days; he had been bled, blistered, vomited, purged, even bark had been administered for the last three days, in the usual manner and quantity, (viz. two scruples every two hours), during remission. The fever had notwithstanding almost lost its type: (I now add, by way of explanation, that it had assumed a second course distinguished by great mobility, usually termed nervous affection). The powers were low and languid; the eyes were dim; vision indistinct; the pulse small and frequent (in its ordinary state); when the head was raised from the pillow not to be felt. In this condition he was lifted through the hatchway in a blanket; some wine was poured down his throat, and he was sprinkled with salt water as he lay on the deck. Appearing to be somewhat invigorated by this process, he was raised up very gently, and several buckets of sea-water were dashed about the head and shoulders. He was then laid in bed: the pulse soon became large and full: I left him in a copious sweat, and was agreeably surprised next day to find him sitting on the deck, to which he had walked without help." This case affords an instance of the effect of cold affusion in the fever of Jamaica at an advanced period of its course; more expressly at that period of progress when the increased heat of the surface abates, when the vigour of the vascular action subsides, and when the distinction of paroxysm and remission becomes so obscure as to be scarcely perceptible. This happens generally after the sixth or seventh day. A new train of symptoms then arises, exhibiting great mobility in animal action, viz. fainting or disposition to faint, tremors, startings and often delirium: the heat is probably lower than that of health, rarely above it: the skin is sometimes moist, sometimes dry:

the pulse small, frequent and changeable. The case described was of this kind; and here no preparation was made by evacuation previously to the affusion of the cold water: on the contrary, the stomach was fortified by a glass of wine, and the first trial of the remedy was made by aspersion. Besides the two now described, which imply two distinct conditions of the fever of Jamaica, the notes furnish the detail of another, in which the application of cold water to the surface was eminently serviceable; but in which, it must be confessed, the circumstances of the patient are not detailed with sufficient precision. "A boy, aged fourteen, had been ill of a fever seven or eight days. Nothing had been omitted in point of treatment which is usual to be done in similar cases. Bark and wine had been carried as far as could be serviceable, or even safe, yet death seemed to be approaching fast. The success of cold bathing, in some instances similar to the present, had so far exceeded my expectation that I was induced to make trial of it in the case before me, although I was not altogether without apprehension that death might be the consequence of the attempt. The business was however accomplished without accident; and next day the boy was able, not only to sit up in bed, but even to walk over the floor." I now add, by way of explanation, for the history is defective, that this case presented one of those conditions of fever which were common in Jamaica at the time alluded to, at least in the district where I resided. The common fever in the environ of Savanna la Mar, in the period between 1774 and 1778, was generally, as I believe I have already observed, a fever of a remitting type, prone to change its form to continued, sometimes on the fifth, sometimes on the seventh day. A new train of symptoms then made its appearance, chiefly characterized by excessive mobility, exhibiting a scene of much uncertainty and alarm,—such as fainting or disposition to faint, *subsultus tendinum*, extreme weakness and occasional resolution of the sphincter muscles, not unfrequently complicated with various forms of delirium. The apprehension of danger in the eye of the inexperienced was here great; the actual danger was by no means in proportion with the external appearances, for those marks of internal congestions, which terminate in organic destruction and eventually in general death, were rarely found in forms of this description. But besides the exemption from internal congestion, the susceptibility of impression was here generally acute; the temperature, whatever its actual degree might be, was equally diffused throughout; hence no preparation was necessary, and in the case referred to none was made by evacuation previously to the application of the cold water.

It is added farther in the note, from which the preceding extracts are made that, "*after instances so unequivocal as the above, it would be superfluous to mention others. I shall only add, that I have tried the remedy in various situations, always with safety, generally with astonishing success; so that I cannot forbear recommending it, even at an* early period, *in the fevers of the West Indies. In regard to mode of management, the water, which is required to be of a refreshing degree of coolness, was generally dashed by means of a bucket on the head and shoulders. It was likewise found, that its good effects were heightened in some cases by previous bleeding, and by the previous use of warm bathing.*" Notes, pages 49, 50, and 51. Such are the principal circumstances noticed in the treatise alluded to respecting the use and management of bathing, employed as a remedy for the cure of the fevers of Jamaica. The remark made by Dr Currie, viz. "*that I had not adopted fully the bold practice either in form or substance, using affusion, but as it should seem partially, on the head and shoulders only,*" cannot be well supposed to apply to the details which I have now given. The manner will be esteemed by many to be rash rather than timid, and plentiful affusion of water on the head and shoulders by means of buckets, while the subject is standing upright or sitting on a stool, will not be held to be a partial affusion; for it is plain, that a few parts of the body only can escape the touch of the stream in its descent. I add farther, that affusion was the mode adopted for the application of the cold water; and it was adopted for the following reasons; first from necessity, because a bathing-vessel fit for the purpose of immersion was not at command; and secondly from utility, because the force of the disease being for the most part exerted unduely in the superior parts, we had thus the means of applying the remedy with force and in quantity to those parts which suffered most. The cases, detailed above, are given as examples of a practice, where the affusion is to be employed in the early stage of the disease and in the vigour of the paroxysm; or, where it may be employed at a later period, when the vascular excitement has abated of its violence, and when the common expression of the febrile action has changed into muscular mobility, probably without manifestation of preternatural heat, but at the same time without signs of those internal congestions or organic derangements, which, as observed before, are always impediments to the favourable operation of cold affusion.

Experience of the remedy in England prior to 1791.

Besides the above extracts, which relate to the use and management of cold bathing in the fevers of the West Indies, some notice is also made of the benefit observed to accrue from it in fevers of other countries, and particularly of England. At page 355. is the following remark, "*I have ventured upon it in the fevers of this country (England) with so great success, that I expect the most beneficial effects might result from a proper management of it.*" A case is detailed at page 74. of the notes in illustration of this opinion, which I here transcribe. "A young man, a sailor, was ill of fever of a very alarming and dangerous kind. It was the eighth day of the disease before I saw him. He had not hitherto been in the least benefited by any thing that was tried; neither did any remedy which I could think of, though employed with desperate boldness, in any degree check the progress of the disease. The power of speech was lost; even swallowing was performed with difficulty; the eye was languid, nay almost without motion; the countenance was ghastly, and many livid spots, some of them the size of a sixpence, made their appearance on different parts of the body. I proposed bathing, and the friends of the young man considering the situation as desperate, consented that I should make trial of it, more perhaps to comply with my desire than from expectation of any benefit that might result from it. Leave was thus obtained; but in setting about the execution of the purpose, it unfortunately happened that a vessel proper for immersion could not be procured, so that we were compelled to be contented with a general fomentation. This was applied in as complete a manner as circumstances would permit. A blanket was soaked in warm salt water, and the body was wrapped in it from head to foot. In a short time the skin became soft and warm; sweat began to flow; the eye and countenance began to resume their animation which had been almost extinguished; the pulse rose; swallowing was performed with less difficulty; and, next day, the colour of the spots was evidently brighter. So far the change was favourable; but a regular supply of wine and cordials having been neglected during the following night, the pulse sunk, and things returned nearly to their former situation. The fomentation was again repeated; in consequence of which the extremities and surface of the body became moist and warm; an effect which was no sooner produced than the blanket was removed suddenly, and the face and breast particularly were sprinkled with cold water, in which a large portion of salt was dissolved. The cold had the effect to make the patient shrink at first; yet in a short time he appeared to be refreshed remarkably. The powers of life grew gradually stronger, though the marks of final crisis were not evident for several days." Such was the case of this young man :—I conclude the paragraph by this general remark: "*To the above I might add some other instances where the effects were similar, but I avoid swelling the notes to too great length by entering into particular details; I shall therefore only observe in general that cold bathing was usually of service; it imparted tone and vigour to the powers of life; and, by increasing the activity of the vascular system, probably sometimes rendered the crisis complete where it otherwise would not have been so; but I cannot venture to say that I ever carried it so far that the disease could be said to be precipitately extinguished by it.*" It is evident, from the context, that this remark relates to my experience of ablution or aspersion with cold water in the fevers of England, prior to the year 1791; and it is there true; for it was principally in the latter stages of the disease that such means were resorted to; and I need scarcely inform the reader that, in late stages, the effect is only auxiliary, not abruptly decisive of cure. Dr Currie refers the reader to this note at page 74; and, drawing an inference from it as if it embraced the whole of my experience of this remedy, remarks that "*the effects were salu-*

tary, but that he (Dr Jackson) did not carry the practice so far that the fever could, in any instance, be said to be precipitately extinguished by it, which is indeed a sufficient proof of the limited manner in which the remedy must have been employed." This, I admit, is true as applied to my experience of cold bathing in England prior to 1791,—and for the reason I have assigned; it is directly contradicted by the opinions I have given, and the experience which I have detailed of its success in the fevers of Jamaica. This is before the reader; and, from this, I think I may be allowed to say that the view here given of my principle and practice is a mutilated one,—the inferences made from it not correctly just.—I have now again separated what seemed to be improperly mixed and blended together in the Medical Reports; and, having done so, I leave the reader to form his own opinion on the subject.

Examination of Outline of 1798.

Dr Currie, having cursorily noticed my treatise on the Fevers of Jamaica published in the year 1791, and having, as has been shewn, passed judgment upon it not very considerately, proceeds, at page 195 of the second volume of the Medical Reports, to dissect my later publication of the year 1798. He observes that, "*in the year* 1798, *a year after the first edition of this publication (Me-*

dical Reports), Dr Jackson gave to the world his Outline of the History and Cure of Fever."—I conclude from the manner in which this sentence is worded, that Dr Currie considered me as deficient in respect to him, or in duty to the public in omitting to mention his improvements of the practice of cold affusion; and, as I am unwilling to bear the charge of arrogance or neglect of the merits of others, I take this opportunity of informing the reader how the case stands. The Outline,—the work alluded to, was written in a foreign country; and it was moreover written at a time when I had no knowledge of the Medical Reports on the effects of water. The plan of it was confined,—limited to a detail of what I had tried myself, or seen tried by others in the course of my official duties,—not destined to collect opinions, note improvements, and record the praises of my fellow-labourers. This is the fact; I consider it to be sufficient explanation on this head.

But to proceed with the examination. "*In the interval between this and his former work, his experience of the remedy in question had extended, and his style and mode of reasoning had undergone a remarkable alteration. I do not profess always to understand the full import and meaning of the new phraseology of Dr Jackson, which is in a considerable degree founded on opinions peculiar to* *himself; nor do I, after a diligent comparison of his precept with his practice, perceive clearly the principles which regulated him in the use of this powerful remedy. I can however clearly see that there is little or nothing in common between us in this respect.*"—To the different points in this quotation I shall oppose a few remarks. In the first place then I observe, that a very extensive field of experience was placed before me in the interval between 1791 and 1798; and in this interval I noted down observations as they occurred to me, and reasoned on what I noted down as if I had no previously established opinion to support, more desirous to attain the knowledge of truth than to preserve consistency in error. The style of writing and the manner of reasoning were thus exposed to causes of change, and I do not pretend to say that they have not experienced it; but I think I may be allowed to say, at the same time, that the principle of the matter in both my works continues fundamentally the same; though, as my experience was more extended, my reasonings are prosecuted further and more fully developed in the latter than in the former publication. I am also aware that my language, though such as arose in my mind from a close and intimate consideration of the subject before me, may appear obscure to others as well as to the author of the Medical

Style and manner of writing.

Reports. I wish sincerely that obscurity had not attached to it, and I shall now take all possible pains to make it plain; but, I may add at the same time that if my opinions be held to be peculiar, I may be indulged with some peculiarity of language for the explanation of them. To give instruction to the practical physician is the object of my work; I shall be satisfied with the execution, and deem myself acquitted of my duty if I attain it, that is, if I discriminate the points of information justly, and deliver the practical precept with such precision that those, who observe, and who reflect on what they read, may be able to profit by what I write. I aim at no higher praise as an author than to be faithful and intelligible. The various and fluctuating scenes, through which I have passed in the course of my public services, have not permitted me to lay in a store of learning, or to enrich my work with the observations of others; it may thus seem naked and bare; but it is genuinely my own—and taken from the book of Nature.—The *want of accord between my precept and my practice;* or the obscurity of the principle which regulates me in the application of the remedy, and which stands next among the objections, can only be judged when the details have been laid before the reader. This will be done in its place; in the mean time I may

Consistency.

observe that inconsistency is not an error that other critics have laid to my charge. Some of them have remarked that the view of the Outline *was bold, but consistent* *. To prove its consistency is a part of my present task; and there is no part of it that I can more easily execute. With regard to the declaration that there is *little or nothing in common between him and me*, I have only to remark that it is well it has been made so explicitly; for it thus fixes what his own principle is, which the interpolated explanations in the various parts of his own work might otherwise have rendered doubtful. As the present is not the place to enter into a discussion on the grounds of the difference according to its principle, I notice the subject no farther than to enable the reader to form an opinion on the point before him. The fundamental, and I may say the indispensable condition, which warrants the safety and insures the success of the effect of cold affusion on the surface, is held by the author of the Medical Reports to consist in increased heat or high temperature: while the reduction of temperature, or subtraction of heat, by the application of the cold water, is maintained to be the cause which dissolves the febrile associations, and thereby cures the dis-

Principle and practice of Dr Currie.

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* British Critic, 1799.

ease. The presence of heat is judged by the application of a thermometer; and when this instrument indicates its existence, the remedy is applied almost without restriction; when it fails to indicate it, the cold affusion has no place. Hence, as increased heat is not always manifest under the action of a febrile cause, the cold affusion cannot always be applied with safety or prospect of benefit according to the implied principle. There is here an evident blank in the practical course, and this author suggests no means of supplying the defect. The ground on which I act is different. The fundamental condition on which I rest is by no means so obvious, or capable of being so precisely measured by the help of an instrument as that assumed in the Medical Reports; but it is a general condition, capable of improvement, almost of creation. It in fact consists, or is supposed to consist in a condition necessary to animal life, viz. susceptibility of impression. The subject, as susceptible, is more or less readily disposed to be acted upon, and, according to relative condition, more or less capable of assuming a new form of action with the application of a new power of stimulation whatever be his temperature. As susceptibilities are different in degree and different in kind, it is evident that, to judge the degree or kind, requires in all cases the exercise of judgment. If the judgment formed on this head be

Principle of the Author.

wrong, we cannot expect the practical effect to be right; for just effect follows, on every occasion, a just estimate of the power of the agent and capacity of the subject acted upon. Hence I conclude that, as susceptibility of impression is variously affected by the action of a febrile cause; and, as cold water is only of a given force, the first practical step of the physician must be necessarily directed to the means of bringing susceptibility to a common level, so that the remedy may act with due impression throughout. This is my ground; and on this ground I institute a process of previous preparation, varied in its forms and sometimes opposite in nature according to the circumstances of the case presented.

Specific objections.

I have now stated, in a cursory manner, the leading condition which guides the author of the Medical Reports and myself in the affusion of cold water on the surface of the febrile subject; I shall next proceed to notice his more specific objections to the mode of practice which I adopted in my Outline published in 1798. He judges it by the rule which he has himself formed. I do not subscribe to the truth of the position or principle according to which he decides; but I reserve the formal refutation of it to another part of the work, and satisfy myself for the present to be judged by the application which may be made of his own experience; or of the authorities which he adduces in the Reports, and which as such, admits to be authentic and true. In the first place he observes that, "*instead of employing the cold bathing in the first stages, when the strength is nearly entire and the febrile heat at the height, Dr Jackson premises copious bleedings and other evacuants, by which both must have been previously reduced.*" I have some difficulty in fixing the meaning of this paragraph. It is ambiguously expressed, insinuating, though not stating expressly, that I do not employ cold affusion in the early stages of fever; or, that I employ it only after copious bleedings and other forms of evacuation. In the way in which the sentence is put, I understand the meaning to apply to the general rule of my practice; but I cannot perceive through what deduction the inference has been obtained; for the general rule of the Outline, or the detail of cases therein mentioned, do not seem to warrant it. But, as I am sensible that I have not been sufficiently explicit on many points in that publication, I shall now mention in a few words the sum of my customary proceeding. In the first place then, the affusion of the cold water was made in the early stage of fever, generally before the patient was conveyed to his ward or accommodated in his bed. This is known to many persons who acted with me when I held a public

Evacuation.

Stage and preparation.

station in the service of the country. This was my customary practice, and the fact is capable of being proved by many still living. But, while I say this, I am also to observe that, if the fit condition be present at an advanced period of the disease, I do not withhold the remedy because the disease is advanced; I however apply it with diminished expectation of decisive success. I mentioned just now that the basis of my expectations of success consists in susceptibility of impression in the subject of the experiment. If that exist in the case when first presented, I apply the remedy without loss of time; if it do not appear to exist, I endeavour to prepare it artificially. This then being my ground, I have to observe further that I rarely bleed where the symptoms are moderate, and where the disease is of a mild character; for instance, in the simple continued, or in simple remitting fever, whether in a temperate or in a tropical climate; or, in the infectious fever of ordinary violence, such, for example, as usually occurs among soldiers quartered in crowded barracks, in crowded and ill-ventilated private apartments, in transport ships, or other places where the air is stagnated and impure from the undue accumulation of inhabitants. The condition favourable for the salutary action of the remedy is then usually present; and it is then obvious that previous preparation is superfluous; or if preparation be then attempted by means of copious evacuation, it is not certain that it may not be dangerous or hurtful. On the other hand, where the heat is deficient, the skin dirty, damp, greasy, and flaccid, or withered and torpid, the preparation is effected by introducing the patient into the air of a warm apartment, by immersing him in a warm bath, by cleansing the skin perfectly by means of soap and warm water, by scrubbing it with brushes and rubbing it with hot towels; and again, where an undue share of the morbid action manifests itself in the first passages, accompanied with a slimy, foul tongue, nausea and flatulence,—a condition, not uncommon where the patient has been confined in the foul air of a crowded barrack, the 'tween decks of a transport ship, or the crowded ward of an infected hospital,—an emetic is usually directed to precede the cold affusion as preparative; whilst purgatives, which operate strongly and extensively, are ordinarily premised where there are marks of congestion and fulness in the abdominal system. And lastly, where the disease is of a violent character and concentrated force, wherever that may be, but more especially in tropical climates,—for instance where the movement is rapid, the action strong, the course precipitously tending to the destruction of an organ; or, where the movement is impeded, the action in a manner suspended, the surface of the body constricted, or internal organs suffocated by a stagnating mass of blood, the preparation is made principally by means of bleeding, the blood allowed to flow till the violent action abate, or till the sluggish course be animated ; for in either case the system regains its susceptibility, and the affusion of cold water on the surface then produces its most fortunate effect. That this principle has long been in my view may, I think, be collected from my publications of 1791 and 1798. In the first, I recommend bleeding as preparatory only in some cases ; I even forbid it in others : in the second, I do not enjoin bleeding in the common infectious fever, and do not admit of it unless where the disease is complicated with local inflammation. In proof of this I observe that, of some hundred cases in the Buff which were submitted to the affusion or aspersion of cold water in 1794, not ten were prepared by bleeding : on the contrary, there was not one in ten, in which bleeding was omitted among those fevers in St Domingo which were presented to me at an early period of their course. This is the fact; and to this cause I ascribe the success of the effect ; for it was generally observed to bear proportion to the care and judgment with which the bleeding was conducted and the extent to which it was carried. From what I have now said, and which I must consider as in some degree proved by the details to be found in my different publications on fevers, it is pretty evident that I do not indiscriminately employ evacuation, particularly bleeding, as preparatory of the affusion of cold water. I consult my judgment in the case; and, though I do not maintain that I never err, and never employ it where I might omit it, I may add at the same time that the Medical Reports themselves furnish proof that there do exist occasions where it may be employed, not only without injury, but apparently with great benefit. Dr Currie informs us, at page 117 of the second volume of the Reports, that Mr Wilson, surgeon of his Majesty's ship Hussar, pursued a mode of practice, which, as far as I can discover, is very similar to that which I recommend in the more violent forms of tropical fever. The success of Mr Wilson's practice was highly distinguished. Dr Currie refers to the Medicina Nautica of Dr Trotter as his authority. I subjoin the paragraph, as extracted from the Medical Reports: " *Mr Wilson's practice was to bleed very early, generally in an hour after the accession of the hot stage. He then gave a solution of emetic tartar. The cold affusion was always administered in cases of delirium, which it imme-*

mediately removed, inducing tranquillity and sleep. Of eighty-three cases, Mr Wilson did not lose one." This event took place in summer 1795, at Halifax in *Nova Scotia.* The sick were disposed in tents on shore, and they were there attended by Mr Wilson himself. The success was perfect; and, whatever the nature of the disease may have been, the fact of the success proves incontestably that bleeding is not a destructive practice in fever; on the contrary, it gives grounds to believe that it is often a beneficial one preparatory to the affusion of cold water on the surface. This record then of Mr Wilson's practice, I am disposed to consider as evidence of the safety and advantage of the mode of preparation which I institute, previously to the cold affusion in diseases of a violent or complicated character; and I am inclined to think that the proceeding which I adopt in this case will strike the reader with impression, as the similar proceeding of Mr Wilson, which was so successful, is admitted to be authentic by the author of the Medical Reports.

I have thus noticed, and I should hope completely removed the first specific stricture made by the author of the Medical Reports on my mode of preparing the subject previously to the affusion of cold water on the surface; I now proceed to submit the second to the consideration of the reader, and I trust I shall do it away equally to his satisfaction. "*Instead of considering the heat of the patient as the principal circumstance to be regarded in regulating the use of this remedy, he (Dr Jackson) appears to have neglected all consideration of temperature in applying it, except in so far as temperature is connected with sensation: and he has not given us a single thermometrical observation in the whole details of his practice, either in regard to the water employed, the previous heat of the patient, or the change produced by the affusion.*" There appears to be some ambiguity of language in this paragraph as well as in that last noticed. If it mean simply that I used no other means of judging of the heat of the patient, except the sensation communicated to my own hand in examining the state of the body, the fact is true; and, I believe the reader will admit the omission not to be important, when he learns that Mr Nagle of his Majesty's ship Ganges, and Dr Gomez of the Portugueze fleet, two of the most brilliant authorities referred to in the Medical Reports, attained a sufficient precision for the application of cold affusion without the help of a thermometer as well as myself: on the contrary if it mean that I neglect the consideration of heat as a matter of no importance, I find myself obliged to

Temperature.

give a statement and a fuller explanation of the fact; for if such be the supposition, it is not altogether correct. In the first place then I declare explicitly, that I do not regard the mere increased heat, or high temperature of the patient as the principal, the sole, or indispensable circumstance which solicits a trial of the cold affusion, which warrants its safety, and insures its success; yet I admit, and all my publications abound with proof of the fact, that I consider the equal distribution and superficial diffusion of heat, as materially connected with that condition of subject which is ordinarily favourable to the successful action of this remedy. That this is my opinion may be inferred from a consideration of the nature of the means, which I adopt in preparing the subject of my experiment where the superficial heat is deficient or where it is unequally distributed. For instance, I introduce him, when cold and torpid, into an apartment where the air is of a high temperature; I pour warm water upon his surface, or immerse him in a warm bath; I scrub his skin strongly with brushes armed with soap; and, having thus rendered the whole body perfectly clean, and increased its susceptibility in consequence of the operations connected with purification and warmth, I affuse the cold water with expectations of increased effect from the circumstances of the condition thus artificially produced.

The sphere of the remedy is by this means extended; its action is rendered sure, its effect certain and complete. When the reasons are explained, which will be done fully in the sequel, the practice, it is presumed, will be considered as an improvement of no inferior importance in the management of this remedy. But though it must appear, from what I have now said, that I do not overlook all consideration of temperature in applying cold water to the surface, I must again repeat that I do not consider increased temperature as principal, sole, indispensable and sure; for my own experience, and even the experience of the author of the Medical Reports *, sufficiently testifies that an increased degree of heat sometimes manifests itself in a febrile subject, without comprehending that precise condition of body which is essential to the successful action of the remedy; while my own observation supplies numerous instances, and authority, adduced and admitted to be authentic by the author of the Medical Reports confirms the fact, that the application of cold water to the surface may, and actually does produce good effect where no increase of heat is discoverable by the hand of a person in health; nay, even where sensation of great cold is manifest.

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* Medical Reports, vol. i. chap. 8.

This sense of cold arises from a modification in the action of the febrile cause which we cannot pretend to explain. It is more common in malignant epidemics than in other forms; and it seems to have been a leading symptom in the fever which prevailed at Breslaw in the year 1737; of which De Hahn has given some account, and from which the Medical Reports furnish me with some extracts which relate directly to the point in question. Cold water was applied in this case by means of sponges. This was done when the surface was withered and flaccid, or covered with an ice-cold sweat: the effect was salutary, viz. animation and fulness of the surface, or dissipation of the icy-coldness under-racking pains. De Hahn's own case may be supposed to have been the most minutely attended to; I shall therefore transcribe part of it, as descriptive of his situation and of the effect produced. It is as follows: "*Those continued ablutions, by which I had been refreshed hitherto, were not neglected on that very day on which I was thought to be dying; for although I was cold all over, bathed in cold sweat in such a manner as if I had been laid in melted ice, the ablutions were notwithstanding performed upon me, my most dear spouse executing the office of washing off this death-like moisture. And I solemnly aver, that I never failed to experience refreshment, at least for a short* *time. When the pores of the skin were cleared by the means stated, a freer perspiration or moderate sweat was the consequence; in so much that the constrictions of the surface seemed to be more readily and effectually relieved by abstersion with the sponge than by the power of any internal remedy*.*"—Med. Rep. vol. i. p. 82. The account here given of the effect, according to Dr Currie's observation, *corresponds with the experience at present.* If this be so, the presence of increased heat is not the primary and absolute condition which sanctions the safety of the cold affusion and ensures its success; for here, there was icy coldness on the skin, and yet sponging of the body with cold water did good. I agree indeed with the author of the Medical Reports that a cold surface does not present the most favourable condition for the application of cold water, and I accordingly institute a process of preparation to obviate that condition; but I maintain, and I believe the reader will assent to my opinion that, if cold water can be applied to an ice-cold surface, not only with benefit but without injury, this author's principle is overturned, and the stricture on my practice, in the paragraph under consideration, is consequently done away.

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* Juges illæ ablutiones, quibus hucusque recreatus fueram, ea ipsa die, qua mori videbar, non negligebantur; licet enim totus algidus algido sudore perfunderer, non secus ac liquefacta glacie immersus, frigida tamen abluebar, maritum servitura charissima conjuge lethales madores, ocius deluente.—Sancteque testor, nunquam non refici ad breve temporis momentum languentes marcidæ cutis fibras me persensisse. Succedebat, repurgatis hac ope poris, perspiratio liberior, ac sudor modestus; videbanturque cutis obturacula promptius spongia remota, quam pharmaci interni virtute reserari.

In regard to the other part of the paragraph, viz. "*that no thermometrical observation concerning the heat of the patient is recorded in my work published in* 1798, *and no notice made therein respecting the temperature of the water employed for affusion,*" a very short remark will be sufficient for the present. The subject of thermometrical observation will be explained fully hereafter. In the mean time I observe, that the Medical Reports themselves furnish sufficient proof, that every requisite practical precision may be attained without measuring the heat of the body by an instrument. This is a point which cannot be refuted, and to this I add that the reader cannot be at a loss to collect, from the circumstances connected with my history of fevers, in what climate, or in what season this remedy is employed. When he has attained this point of information, his conclusion respecting the common temperature of water is not likely to be very erroneous. I may however now remark, and the substance of it may be collected from one or other of my publications though not so fully and explicitly expressed perhaps as it ought to be, that the water was directed to be as cool as it could be obtained in tropical climates; that is, drawn from the deep sea, the spring or reservoir, early in the morning, placed in the shade during the day, and sometimes cooled artificially by dissolving salt in it. In higher latitudes, viz. in Europe, it was employed at the common temperature of the place and season; only with this difference, that in summer it was affused suddenly and in large quantity by means of buckets; in winter, more gradually, and in smaller quantity,—often by sponges or gentler aspersions.

Pulse and skin.

The next paragraph, viz. "*That the previous or subsequent dryness or moisture of the skin forms no part of his observation, and even the very remarkable and almost uniform effect of this remedy on the pulse, is entirely unnoted,*"—is perhaps not very correctly stated. The points alluded to, though not indifferent among the things to be considered by the physician, though in fact not overlooked by me when I form a plan of cure, and not ordinarily omitted when I detail a case for the information of the public, are not, I confess, points of the first importance in my estimation. The cold water for instance, is applied with a fortunate result, provided other circumstances are favourable;

sometimes where the skin is dry and withered, sometimes where it is greasy and damp; and further, sometimes where the pulse is strong, frequent and hard, sometimes where it is weak, little accelerated in movement, lax and compressible in manner. It is probable that, from a knowledge of this fact, I may seem to have less regarded the condition of the skin and the state of the pulse in applying cold water to the surface than the author of the Medical Reports does himself, or thinks necessary to be done by others; but when I admit this, I must at the same time remark that where I employ affusion, without preparing the previous condition of susceptibility, I generally employ it at the period of exacerbation, consequently when the skin, according to the ordinary course of things, is dry as well as hot. But, while what I now state with regard to the condition of the skin is usually in my view when I employ the remedy in question, I must also add that my principle does not positively forbid aspersion, ablution by the sponge, even affusion by means of buckets where the superficial heat is lower than that of ordinary health, and where the skin is withered or greasy, damp and clammy, even where it is moist and open, such as in common language is termed relaxed,—not such, it must be remembered, as obtains in critical perspiration terminating the paroxysm of a periodic fever, or marking the solution of one of continued form:—it would then be preposterous, unnecessary, if not dangerous. The case of De Hahn, mentioned above, may serve to give an illustration of what I mean; and I refer to it for explanation as it stands on record in the Medical Reports. Ablution by means of the sponge was there employed when the surface was covered with an ice-cold sweat; the action of the skin was apparently restored by it to a form more healthy and energetic; and, as the experiment was made on the person of De Hahn himself, we must allow *his* testimony to be good evidence of the fact.—The effect of the affusion, as I observed above, is beneficial when applied under very different conditions of pulse; but I now add, that the remedy was managed differently, according as the pulse was high or low, strong or weak. Where it was high, strong and irritated, the affusion was made by means of buckets, the water applied in quantity; where it was small, soft and easily compressed, for instance in cases of great mobility and diminished power, the water was applied by sponges in ablution, and sometimes by aspersion.

General remarks,

The points, which I have now noticed, are the more specific strictures applied by the author of the Medical Reports to my Outline of 1798. The facts recorded in the Reports, which Dr Currie admits to be authentic and to which I have referred, seem to me, not only to do away these very strictures, but to undermine the basis of the principle through which they were formed. The subject will be considered at length in the sequel; in the mean time what is now said will be sufficient to arrest the reader's attention, and to incline him to suspend opinion till he ascertain the fact, and weigh the argument on both sides in a fair balance.

The next paragraph in the Reports which relates to my Outline is the following, and it requires only a short explanation on my part. Sensibility. "*Nor have I the satisfaction of agreeing with Dr Jackson on the manner in which the sensibility of the patient ought to influence us in the use of the cold affusion. He requires a state of high excitement or sensibility of the surface in the application of the remedy, and considers its benefits are wholly dependent on this previous condition; whereas an extreme sensibility to the impression of cold (which according to my experience often attends great sensibility of surface in fevers), deterred me from employing it, when the actual heat of the patient indicated its use.*" It is probable that I have not expressed myself clearly on this head, for it is evident that Dr Currie has not apprehended my meaning rightly. The condition which I require for the application of the cold water, and which I endeavour to create if it do not already exist, consists in susceptibility of impression conjoined with the capacity of producing effective action. It is attained in one case by superficial stimulations, particularly by processes similar to those practised in the Russian bath; in another by subtractions, particularly by copious bleeding, the evacuation made suddenly, but conducted with caution and minute attention through all the steps of its progress. The susceptible condition, according to my interpretation of the word, is different from that extreme sensibility to the impression of cold to which this author alludes at page 49. of the first volume of the Reports. I confess that I have not often, if ever, seen a disease exactly resembling that which is there described; but I have often seen fevers, particularly infectious fevers, where the skin was so tender of the touch that the patient shrunk when I approached him for the purpose of feeling his pulse, and probably called out when I pressed his arm closely with the view of ascertaining the condition and quantity of heat in the deep-seated parts. This condition occurred frequently on the continent in the winter 1794 and 1795 among the soldiers of the Buff or Third Regiment of Foot.

The skin was here painful and tender, as if it had been bruised; yet affusion, or ablution with cold water was of singular value in this as well as in the other forms of fever which appeared in that corps. I do not presume to speak positively on a subject of which I have had no direct experience; but I am inclined to think that if the existing condition of the skin, in cases similar to that noticed by Dr Currie, were artificially changed by immersion in a warm bath of high temperature, and by frictions with warm and penetrating oils, the affusion of cold water, particularly with the addition of salt, might be expected to be of high service, if not decisive of abrupt cure.

General conclusion.

Dr Currie concludes his examination of my work of 1798 with this remark: "*It would not become me (Dr Currie) to pronounce judgment on the very important differences between Dr Jackson and myself; this must be left to future observers. But from the experience which I have detailed I cannot be surprised at the imperfect success of the remedy in his hands, or that other practitioners in the West Indies, who had adopted it on the same or similar principles, should have afterwards abandoned it.*" I willingly submit the case between the author of the Medical Reports and myself to be decided by the experience of such future practitioners as shall observe with attention and judge without prepossession. I have no farther interest in the decision than that the public may see the truth, and adopt the rule of practice which is most useful and effective of good. I may however observe in this place that my opinions have been judged, and my practice condemned without full evidence of trial. Dr Currie has drawn his inferences from what he saw himself; and his sphere of observation was comparatively a narrow one. Had his situation presented him with examples of fever in its more concentrated and difficult forms, he would, I believe, have expressed himself less confidently than he has done concerning the power of the cold affusion employed in the manner which he recommends; and I also believe that had he been where I have been, and seen diseases under all the forms in which I have seen them, he would have withheld those strictures on my publication of 1798 which I have now examined, and, as it appears to myself, completely set aside by induction from his own authorities. When I speak in this manner of Dr Currie's opinions, I do not mean to insinuate that his testimonies in favour of cold affusion are exaggerated or misrepresented; for I am well assured, from my own experience, that the affusion of cold water is capable of cutting short the course of a mild and simple fever without preparation of condition, when applied as he directs it to be applied, whether in Europe or in the West Indies; but, while I admit this, I am also convinced from no less certain evidence that it is liable to fail in the more violent and concentrated, unless the proper condition of fitness in the subject be prepared artificially previously to its application;—it is then only that the affusion can be regarded as sovereign. To prepare this condition, where it does not already exist, forms the basis of my practical rule; the just execution of it is considered as the circumstance which gives full effect to the after process. That this was my opinion in the year 1798, may, I believe, be concluded from what is said in my Outline, at page 286, viz. "*Cold bathing has been frequently employed in the fevers of hot climates; but it has not always been employed in the proper manner, or under proper circumstances of subject. Cold bathing is in most cases followed by agreeable sensations, and a temporary relief from the pressure of symptoms; but its effects are not permanent or extensive, perhaps not safe in full habits and under the torpor of plethora. In such circumstances, it has been found to do no good in yellow fever, and, employed frequently under such circumstances, it has been considered by many as a remedy of little value.*

The author (myself) is however confident to maintain that, wherever the sensibility of the fibre has been restored by previous bleeding and other suitable processes, no remedy in the circle of medical assistances produces such beneficial and permanent good effects,—travelling perhaps excepted. Its good effects are eminent where employed under proper circumstances in the endemic fever of tropical countries; in the infectious fever of ships and hospitals, cold bathing and washing with cold water exceed in benefit all the resources of the medical art. But cold bathing, like other remedies, requires a certain condition of things to insure the success of the application; and it happens generally that where the condition is disregarded, a fault (a failure) is charged to the remedy which in reality belongs to the judgment of the prescriber." This language is not equivocal; it does not imply that the application of the remedy was indiscriminate, and it does not acknowledge an imperfect success from its application where the condition of the subject was fit and proper; whether belonging to the disease in its own form, or attained by preparation through art.

The insinuation, that the "*success of cold affusion was imperfect in my hands*," is a point, in the above paragraph, which, however irksome the notice of it may be, I cannot pass in silence. I confess I am not able to trace the channel through which the author of the Medical Reports attained his conclusion respecting it; for it does not appear, by my own confession, in any of the works which I have published on the subject of fever; and, if judged to be a necessary consequence of the rule of practice which I recommend, Dr Currie's own experience or that of his correspondents will not, I believe, furnish such evidence as will be thought sufficient to bear him out in his assertion. He seems to consider it as an error that I premise bleeding or other evacuation previously to the application of cold water to the surface. My publications on fever shew plainly that I do not employ bleeding indiscriminately; and the practice of Mr Wilson, quoted above and admitted to be authentic by Dr Currie himself, shews clearly that it may be employed in some forms of febrile disease, not only without injury, but apparently with benefit. It is objected, that I do not consider the heat of the patient's body as the principal circumstance to be regarded in regulating the use of cold affusion. I am ready to admit that I consider heat only as a secondary circumstance, though by no means an indifferent one, in directing my judgment in this respect; and, I further add that I am not deterred from applying the remedy when the temperature is low, provided other circumstances be favourable for its safe and successful action. The instance of De Hahn stands in proof that ablution with cold water may be salutary, even where the surface of the body is preternaturally cold. Thirdly, it is insinuated that the practice cannot be precise without thermometrical observation. I am of a different way of thinking; and I refer to Mr Nagle and Dr Gomez, two of Dr Currie's most respected authorities, in proof of my opinion. From what I have now mentioned, the reader I presume will have no difficulty in admitting that the strictures, pronounced against my rule of practice by the author of the Medical Reports, are not supported by the experience detailed in these reports; and therefore that he has not considerately referred to it. I have only to add that, if I had not believed in the success of what I did over the success of common practice, I could not have had the assurance to lay it before the public with commendation; but, that the reader may form his own opinion on this subject from official facts, I shall state the proportion between deaths and recoveries in fever among the persons who were committed to my care in the different countries where I have served, or exercised my profession. In the first place, the mortality in the fever of Jamaica, between the month of March 1774 and the beginning of January 1778, in a company of soldiers of the 1st battalion of the 60th regiment quartered at Savanna la Mar where I resided, did not exceed one in fifteen. I do not possess detailed returns of what I now state: indeed regular returns of hospital casualty were not then made by me; but I have been able to collect, from notes or memorandums that are still among my papers, that one in fifteen was nearly the proportion. This I confess is a low mortality from fever in a tropical climate; but I must observe, in accounting for it, that the disease was ordinarily mild in its nature, and that the persons alluded to were seen in the first hours of indisposition; so that a favourable opportunity was thereby given for effecting an abrupt cure. That this was the principal cause of the favourable return, may be concluded from what happened to sailors, or such of the civil inhabitants as came under my care during my residence at this place. The mortality among such was not less than one in five; for the disease was often completely formed before it was presented to me; and, when that was the case, it often proceeded in its course to a regular critical termination in spite of all my efforts to arrest its progress. A loss of one in three was considered as a favourable return from the military hospitals of St Domingo, in the years 1796 and 1797. In a time of general sickness and great mortality, I assumed the office of regimental surgeon for the 56th regiment, which was stationed at the Mole, Cape St Nicholas, in the year 1796. I continued in the exercise of this office for six weeks, and, during that time, the proportion of deaths, among fair cases of fever, did not exceed one in twenty. This is official, and I can venture to say, though no official return was made of the fact, that the result was equally favourable among those individuals who were submitted to my care at the commencement of the disease, in subsequent periods during my continuance in that island. The proportion of deaths among febrile patients in the Buff, was still smaller than what is now stated. During a period of eighteen months at the commencement of the late war, two hundred and fifty febrile patients were dismissed as cured from the lists of sick of that corps, exclusively of those who were sent to general hospitals in various stages of convalescence, when the means of accommodation were deficient, or when waggons were not allowed for transport in the event of the army changing its ground or position: of these only two died; consequently, the mortality did not exceed one in one hundred and twenty-five. This is certainly low; but it is to be taken into the account that I was surgeon of the regiment. As such, I saw the disease at its commencement; nay I even in a manner domesticated with the sick, administered the medicines with my own hand, and superintended every important act of discipline which concerned those who were seriously ill. Further, I acted as physician and head of the hospital at the army depot for the whole of the year 1801. The mortality among febrile patients, while the depot remained at Chatham, stands as one in thirty-two; at the Isle of Wight, where an epidemic of great malignity prevailed, where none but dangerous cases were admitted into the hospital list, and where the miseries of the hospital and barracks opposed great obstacles to the recovery of health, it stands as one in twenty-three*. This is official, and it is not high comparatively; for we find that mortality, in the house of recovery at Liverpool during a space of four years according to Dr Currie's own report, amounted to one in ten and a half†. Such are the comparative statements of mortality from fever. I leave the reader to form his own opinion of the fact and its inferences; but I cannot perhaps dismiss the subject, as it respects the West Indies, without adding a remark of explanation to what I have here stated. It may seem to many that I rate mortality very low in tropical climates; but, from what I tried with the 56th regiment, and from what I have tried and proved on other occasions, I can say without exaggeration that I, or any other person who conceives the principle aright, and who gives a just degree of attention to the execution of his purpose, may promise a fortunate issue from fever in those countries with as much confidence, even perhaps with more certainty than in the temperate climates of Europe; for, while it is possible so to station troops in the West Indies that there shall be little sickness, so it is possible so to treat the sick that there shall be little loss by death *.

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* Constitution of the Medical Department of the British Army by the Author.

† Medical Reports, vol. i. p. 367.

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* An opinion so bold, and so little corresponding with the experience of the present time, may appear to require some explanation. This is not however the place to enter into a detail of reasons; and it is less necessary to do so, as I have considered the subject at some length in my View of the Formation, Discipline, and Economy of Armies, published in the year 1804. I shall therefore content myself at present with stating the principal points which ought to fix the attention of those who have the power of forming arrangements, calculated to prevent sickness or diminish mortality among the troops stationed in the West Indies; which, notwithstanding its importance in all points of view, does not seem as yet to have been once considered with a scientific eye by those in office.

The interior parts of the greater number of the islands of the West Indies are mountainous; and as such they are healthy, at least not unfriendly to the health of Europeans: the sea-coast on the contrary, particularly the site of the greater

But, that this purpose may be attained with a calculable certainty, it is indispensably necessary that the sick subject be seen at the commencement of the illness, as well as that his case be treated

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number of the towns where troops are usually stationed, is commonly low, often swampy; and swamp exhalation is known by experience to occasion diseases, which prove destructive of the life of the European subject to an extraordinary extent. This fact is known to every person who has served in those climates, whether in a military or medical capacity. It therefore arises by direct inference from a knowledge of the fact that, if it be an object of value to preserve the health and lives of British soldiers destined to serve in the colonies, the first step of progress towards effecting the purpose consists in choosing healthy stations of cantonment, viz. stations in the interior, at least in the mountainous parts of the island. This is self evident; and, if it can be made level to our apprehension that defensive security in position, for commanding the sovereignty of the island, is capable of being joined with the preservation of the instruments of defence, that is, the health and life of the soldier, it must be thought to argue a want of political wisdom, speaking as a calculator of loss and gain, to delay giving effect to a measure which promises so great advantage. That the objects here alluded to may be easily combined, no military officer of observation and reflection, who possesses local knowledge of the qualities of the islands of the West Indies, will pretend to deny. Whether, any of them have submitted views on the subject to the Ministers of State for their high consideration, I do not affect to know; but I can have no doubt in believing that many of them are convinced, from their own observation, of the truth of the suggestion which is now made. If the purpose here sought for, viz. systematic defence by connection of positions, and preservation of health by withdrawing the troops from the sources which produce disease, be admitted to be attainable; the next point which presents itself with boldness and skill when it is seen. The practical view is a plain one at this period; the process easy, and the effect comparatively sure. In the more advanced progress, the view is often compli-

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to be considered, relates to the execution of the arrangement projected for carrying it into effect. As the purpose is complex, comprehending three distinct conditions, viz. military combination by a secure communication of stations, defensibility of stations by natural properties or by the helps of art, and lastly, character of positions as relative to the subject of health; the knowledge, required to ascertain these requisites being various and partly professional, cannot be supposed to be fully united in one person; hence the institution of a commission, consisting of a general, an engineer, and physician, all of them eminent in their walk, evidently presents itself as a measure calculated to bring together the means which are capable of organizing this important concern on a systematic basis. If the stations be so chosen as to secure facility of communication with each other, and at the same time to possess salubrity of air, the works of art so constructed as to afford security in defence, we infer that the island, so fortified, is safe against the permanent impression of foreign force, and particularly well guarded against the chances of domestic insurrection. The plan suggested in this place supposes the European troops to be stationed in the interior, at least in mountainous, healthy, and commanding positions; it consequently seems to leave the harbours and sea-coasts without direct and immediate protection. This might not be safe in times of war; and the colonist, were it safe, would not be satisfied if his wharfs and warehouses were neglected, though no real danger apparently threatened them. The regiments of colour, which have been added lately to the lists of the British army, supply the means of affording the protection wanted with every prospect of security to the colonist, and without exposing the health of the European soldier to noxious exhalations from swamps and other cated, the means of simplification difficult, and the effect uncertain, even in the hands of the most skilful.—I here add by the way that the affusion of cold water on the naked surface constituted a

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offensive matters. That these troops may be applied to this purpose, without cause of apprehension to the most scrupulous, is a fact which no one who knows them will dispute. But, as the sovereignty of the islands of the West Indies must depend, if ever the question comes to be tried by foreign force, on the energy of the European soldier, and the skill with which the central defences are arranged; so the preservation of *their* health, and a judicious disposition of *their* quarters for union of action are points of the first importance to the nation,—such as demand a scientific consideration—in humanity as well as policy. It will be denied by no one, who is acquainted with the West Indies, that much might be done in improving and connecting the defences of the islands by giving effect to a plan of arrangement similar to that now suggested: it is demonstrative, for it has been proved in experience, that a great deal would be done by it towards the preservation of health,—for it keeps the causes of sickness at a distance: and, while health is preserved by some such disposition of the troops as that now projected, it is evident, if we review the records of medical practice with care, that disease may be treated with infinitely better effect by instituting a proper system of medical discipline, than by pursuing the routine of the present times. This is a part of the subject which has, as yet, met with no considerate attention; for, though our armies are provided with physicians and surgeons in a proportion far exceeding the just needs of the service, yet we cannot pretend to say that our medical officers are generally acquainted with the diseases of foreign climates when they enter on their responsible office. The diseases, particularly the fevers of the West Indies, are ordinarily of a rapid and precipitous course: the time left for deliberation is short, and danpart of the means which were employed by me for the cure of this disease; but, I apprize the reader at the same time that, it did not comprehend the whole of the means, not always the first, and not always the most important.

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gers are so urgent that the European discipline makes little impression in arresting the fatal progress. This is an acknowledged fact: hence I maintain that regimental surgeons should be instructed by direct examples of experiment in the manner of curing tropical fevers speedily and safely; and hence I propose, that one or more persons, competent to the duty of instruction, be stationed in the West Indies ready to repair to the head quarters of troops as they arrive in the islands, and directed to remain there till there be conviction from experience that the regimental medical officer is sufficiently instructed in his art, or till it be proved by trial that, deficient in capacity or attention, he is unworthy of a trust of such importance as that of taking care of the health of the King's soldiers; consequently, that deficient or careless he be removed from the service, his place supplied by another who is better qualified in knowledge, or more zealous in executing what he knows. When the regimental surgeon is present at his post, ready at the first call for duty, and such as he ought to be in professional qualification, the terrors of tropical fevers may be supposed to vanish. The disease in fact will be little formidable, if the proposition made in this place be properly executed; for, as its character is soon declared, its course may be soon arrested by bold measures. If this subject were well considered by those in power, the defences of the West Indian islands might be so arranged that Britain would cease to view her colonies as the devouring grave of her armies. We are indeed fed with hopes, and taught to look with expectation on this subject; but I am afraid we look in vain.—*See Lord Castlereagh's Speech on the Honourable A. Cochrane Johnstone's motion in the House of Commons*, 1807.

Bleeding frequently preceded it; and, in the more concentrated forms of the disease, previous and copious bleeding was essential to success; for it is proved to demonstration, in my own experience at least, that, unless the susceptible condition be duly prepared by evacuation or other means adapted to the circumstances of the case, the affusion of cold water, though it almost always refreshes the patient for a time, does not certainly produce a decisive and permanent cure.

In reply to the concluding sentence of the paragraph transcribed above, viz. "that *others who had adopted the practice on the same or similar principles (with me), had afterwards abandoned it*," I have little to remark. I do not myself know any one who employed cold bathing according to my principle, and who afterwards abandoned it. Dr Currie instances his friend Dr Ord of Demerara; but the reference is not a fortunate one, for Dr Ord says expressly that he had misapprehended Dr Currie's meaning, "*not conceiving the principle on which Dr Currie used it, was to procure the solution of a febrile paroxysm, but to assist with other tonics in restoring strength to the constitution after the febrile catenation had been removed.*" If this be Dr Ord's view in applying cold water to the surface, I may safely venture to say that he did not derive it from me. The reader is fully aware, from what has been said repeatedly in the preceding pages of this work, that I employ the affusion of cold water while the disease is in the vigour of its course, not when it has remitted or ceased: but it would be superfluous to prosecute the subject any farther, for it is of no real importance to any one to know whence Dr Ord derived his rule of practice.

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* Medical Reports, vol. ii. p. 199.

Such are Dr Currie's strictures on my Outline of the History and Cure of Fever published in the year 1798. The work, as I observed before, was written in a foreign country; consequently it was written under disadvantages. I hold the facts to be faithful: I am sensible that the manner in which they are presented is not the most alluring; and I should not be chagrined if the Outline were not praised, I am called upon to vindicate it from the imputation of leading others into error. This I trust I have now done, and I am particularly indebted to the author of the Medical Reports for supplying me with authorities from his own stores, which have assisted me so materially in establishing my positions. It is more than I could have expected; and, from the manner in which it is attained, it cannot fail to make impression on the mind of the reader.

The author of the Medical Reports having noticed, as has been seen, my publications of 1791 and 1798, and impugned the principle on which I act in applying cold water to the surface as a remedy for the cure of fever, proceeds to remark, Note. in a note, on my later publication of 1803: "*In his (Dr Jackson's) remarks on the constitution of the medical department of the British army published in* 1803, *Dr Jackson has again entered on the treatment of fever, and on the use of bathing as a remedy, at considerable length. On this occasion he mentions my (Dr Currie's) name, as having by the popular manner in which I treated the subject, drawn some notice to the remedy; but claims to himself the merit of having used it for thirty years, and of having communicated it to the world, as it would appear the first of our countrymen in* 1791. *Here, as in his former publications, Dr Jackson unaccountably neglects to introduce the name of Dr Wright, who, from MSS. in my possession, unquestionably used the cold affusion in small pox several years before* 1774, *and who communicated for publication his remarkable narrative, with which this work commences, to the Medical Society in London in* 1779. *This most important narrative, in consequence of accidental circumstances, was not inserted in the only volume of the Medical Observations and Inquiries after-*

wards published by the Society, but was recovered from among their papers in 1786 *on Dr Wright's return to Europe, and given to the world in the widely circulating journal of Dr Simmons in that year; five years of course previous to the first publication of Dr Jackson.*" The paragraph, which I have here transcribed, betrays signs of irritation beyond what might be supposed to arise out of the case. The term *popular*, which I applied to the manner in which the Reports are presented to the public, gave umbrage to their author; and it raised high indignation in the breast of the editor of the Edinburgh Review. I did not mean it offensively; but I cannot perceive that I applied it improperly. A medical work may be considered as of two characters, viz. technical or popular. If a person write a tract upon a disease, for instance on fever, detailing its history, symptoms, degrees and varieties, with great minuteness, noticing its supposed causes, and arranging the means of cure systematically, according to their relations with each other, we say at once the work is technical, as it is calculated for the information of professional men only, or rather for that class of them who think and reason before they proceed to act. On the contrary, if he write a book, and propose a general remedy for the cure of the disease which we denominate fever, for instance the affusion of cold water on the surface, we say without hesitation that the work is popular, for every one of the people knows what the remedy is: and further, when the condition which warrants its application is stated to consist in increased heat of surface, which is an obvious condition; and when the presence of that condition is moreover judged by the scale of a thermometer, the adjustment of which implies no secret science, while the application of it precludes the chance of incurring mistakes, any person of common sense may think himself competent to undertake the management of the cure, though he do not inscribe his name among the professors of the medical art. This last character applies to the Medical Reports; and from this view of the subject I deem myself justified in the use of the term *popular*, independently of the additional argument of the miscellaneous and varied matter which amuses the fancy, or the smooth and flowing language which charms the ear and entices the multitude to read the volumes in question.—So much for the term *popular*. The other point, viz. my pretension to an early employment of cold affusion, is explained circumstantially in the first part of this Exposition: the proofs of its authenticity, therein stated, are such as I believe no reasonable person will doubt. I am not conscious that I arrogated any merit to myself for the share I had in putting to trial, in the fever of Jamaica, the suggestion which I accidentally obtained concerning the power of this remedy. I owed it, as I said before, to Captain Cunningham, not to Dr Wright; and I trust I have now accounted satisfactorily for my *unaccountable* neglect of that gentleman's celebrated narrative.

In another paragraph of this note Dr Currie observes, "*In the remarks above referred to, Dr Jackson defends his doctrines respecting the use of cold bathing with some seeming modifications. He now considers the presence of heat (*i. e. *morbid heat) in a patient, however produced, as a general index of forming a judgment of the result; but this obscure expression does not mean, that when present it indicates the use of the remedy, or that its absence prohibits it.*" The base of my opinions on the subject of cold bathing in fevers has always been one and the same; but, in the interval between 1798 and 1803, my experience of the remedy was extended, and my mode of managing it was perhaps improved, in consequence of what I had observed of the effects of alternations of temperature among the Russian troops during my service with that people. The principle upon which I act, both in general and in detail, will be explained more fully hereafter in the third part of the work.

Again, "*Dr Jackson occupies several pages in controverting the rules I have laid down for the application of the cold water to the surface, and in laying down others of his own. Experience must decide between us, and to that I appeal.*" This is a point which ought to be viewed without irritation. As my attention had been drawn to a consideration of cold bathing, as a remedy for the cure of fever, before Dr Currie appears to have commenced his medical career, I may be allowed to state my principles and explain the rules which guided me in the application of it, without a charge of intrusion. If I have controverted the rules laid down by him, I have not done it by assertion, —without fact or argument; and, if I have produced argument supported by reason, and evidence of fact supported by success in effect, those who search for useful truth on its own account will know how to choose.

Lastly, "*If I were inclined to enter into any thing like controversy with him (Dr Jackson), I should soon find myself involved in that obscurity with which his peculiar (originally cabalistical) phraseology invests every medical subject on which he treats.*" This is language of a high tone,—scarcely decorous in the writings of a liberal physician; I therefore pass it without remark,—for science profits nothing by retorts of petulance.

PART III.

COMPREHENDING A SUMMARY VIEW OF THE THEORY OF FEVER; A DETAIL OF RULES FOR PREPARING THE FEBRILE SUBJECT PREVIOUSLY TO THE APPLICATION OF COLD WATER TO THE SURFACE; A HISTORY OF THE EFFECTS OF COLD DRINK, AND OF GESTATION IN THE OPEN AIR IN WHEEL-CARRIAGES OR OTHER CONVEYANCES; WITH AN ELUCIDATION OF THE PRINCIPLE THROUGH WHICH THESE MEANS ARE SUPPOSED TO ACT IN PRODUCING SALUTARY CHANGES, OR ABRUPT CURE OF THE DISEASE.

CHAP. I.

Summary of the Theory of Fever;—History of Conditions and detail of rules for preparing the subject and regulating the application of Warm and Cold Water to the surface;—Elucidation of Principle.

I STATED, in the preceding pages of this work, the more essential points of objection which the author of the Medical Reports brings against my different publications on the subject of fever, either as deficient in precision, or as expressing doctrines contrary to the view which he himself maintains. He unequivocally controverts the principle on which I act, condemns the rule of practice which I adopt, and pronounces the effect to have been unsuccessful. A review of the returns of the hospitals, of which I have had the charge in the course of my public services, shews how the last point stands; the others I shall now endeavour to explain. But, as the subject of this Exposition, viz. the affusion of cold water on the surface of persons ill of fever, is an important one, deserving to be accurately known in all its relations, I consider it as a necessary preliminary, previously to my entering upon a consideration of its management, to exhibit a general view of the febrile process, in so far as the nature of that process can be learned from the observation of effects produced on the various functions of the human body by the action of a febrile cause. And in the first place, I judge it proper to submit to the notice of the reader the principal points of the theory, or explanation of the febrile mechanism given by the author of the Medical Reports; and, I do this the more especially, as there is one of the points in this theory which has an indispensable connection with the rule of practice adopted for the cure of the disease.

Examination of Dr Currie's theory of fever.

The following is the theory or explanation here alluded to: "*Debility of a peculiar kind is then the first operation of the remote cause producing fever: the necessary consequence, or as some contend the concomitant effect, is a spasm or contraction of the arteries, but more especially of the extreme vessels and capillaries of the surface; hence follows an accumulation of blood on the heart and lungs—the re-action of these organs—the generation of morbid heat and morbid association.*" The ground of the theory here presented is the same as that assumed by Dr Cullen, resting however with more notice on *morbid heat*, and admitting into the chain of operation an appendage of *morbid association* which did not occur to the illustrious professor. The explanation may be allowed to possess the praise which is due to ingenuity: it is imposing and plausible at first sight; but, if we look into it minutely, its difficulties and incongruities are so numerous and so pointed, that I cannot suppose it will long maintain its reign with those who take the trouble to observe, and who consider the connections of the things which fall under their observation. The first position, viz. "*That debility of a peculiar kind is the first operation of the remote cause producing fever,*" is assumed by opinion, not established by proof. If fever occur, even but once in five hundred times,

Debility.

without cognisable debility, we may be allowed to hesitate before we give our assent to the truth of this fundamental position. That fever does so occur on some occasions is certain, if we are to be guided in our judgment by the patient's sensations, or by such artificial measures as can be applied to ascertain degrees of force in animal action. But, taking the general position for granted and admitting debility to be the first effect of the action of the febrile cause, we are left in the dark as to the nature and character of the cause which produces that effect. As every effect is produced through a preceding action of some form or other, we must suppose action to be weakened or lowered by subtraction of customary stimulation, or to be perverted or changed by some form or other of new and forcible impression. The subtraction of customary stimulation may be termed sedative; and the debility which belongs to it may be said to be simple or common. On the other hand, if there be evidence of change in the organic condition of the subject, we do not suppose the cause to be sedative: a previous action is implied in the effect; and, as this action arises from previous impression or stimulation, the debility which depends on it may be said to be compound or peculiar;—its character is however unknown. This febrile debility, however produced, is not defined in the Medical Reports otherwise than by the adjunct *peculiar*. Peculiar gives no intimation of nature and character: we thus learn nothing more but that debility is the first operation; and that, joined with this debility, there is something which we do not know. As common or simple debility is not allowed to constitute the base of the febrile process, we are necessarily brought to place the first step of the operation on this something which is said to be peculiar, and which, as such, is admitted to be unknown: hence the base is visionary or arbitrary. It possesses no precise definition; and, thus undefined, the fabric erected upon it cannot be consistent, sure, and permanent. Debility, as applied to animal action, is negative of strength or effective power. It may be simple or compound; but if it actually do exist, whatever be its character, we cannot, according to the common laws of animal mechanism, look for any effect from its presence except rest or non-effect. Whatever may happen contingently, re-action cannot be supposed to happen directly as a necessary consequence of debility; it is notwithstanding added, in the explanation of the febrile chain which I now consider, "*That the necessary consequence, or as some contend the concomitant effect, is a spasm or contraction of the arteries, but more especially of the extreme vessels and capillaries of the surface.*" This is an assertion of which

Spasm.

no direct explanation or proof is offered, and of which I believe no satisfactory one can be made out if we permit ourselves to be guided by the appearances which present themselves in the histories of febrile disease. If debility be the radical base of febrile spasm, we must hold it to be so uniformly—not contingently; for the base cannot be supposed to be wanting where the action or superstructure exists. If it be so radically, its rise will be after one uniform rule; we therefore conclude that, according to this position, there must necessarily exist a point in the descending scale of actions beyond which depression cannot pass without the manifestation of re-action, spasm, or movement of a new form and character. Debility is said, according to this theory, to produce spasm; yet if we form opinion by sensation, or by the expression of action in muscular parts, particularly by the action of the heart and the pulses of the arteries, which are ordinarily assumed as the measure of organic strength, we find depression or debility descend to a low point on some occasions, without obvious spasm, or marked constriction of the capillaries of the surface following as a consequence of the implied condition; and, on the other hand, we observe spasm to be sometimes present generally or partially, the surface to be strongly constricted, the subsequent febrile action to be high and vigorous, and yet the sensation of debility to be scarcely perceived by the patient himself; or, if it exist, to be so inconsiderable that the physician cannot measure its degree with any precision. This is a fact of no rare occurrence; and, from this fact, we see evidently that no regular proportion is preserved between the supposed cause and the ostensible effect. Hence we conclude, and I do not see how the conclusion can be avoided, that debility is not, in its own proper nature, the indispensable cause of spasm. I admit indeed that debility may, and frequently does precede spasm; but I maintain that it does so only contingently; it is not the base or stimulus of necessity which produces this link in the chain of the febrile process. This opinion perhaps is heterodox; for I believe that pathologists generally consider debility as the parent of spasm, and I am aware that there exist appearances which give countenance to the supposition. For instance, if any one action, or a series of actions be brought to a point of arrest, either by suspension of the customary cause of stimulation, or by the application of a new and foreign stimulation which disturbs or subverts the healthy condition; the action which recommences after this suspension or arrest, if action does in fact recommence, is made by catch or spasm. The fact is admitted, but its character is different from that of febrile spasm; for, though the renewal of the action be evidently spasmodic, the effect seems to be owing to the application of a cause which stimulates generally, and which is generally diffused in the medium in which the animal lies quiescent; or it is owing to the action of particular means applied to a particular case. It is not a necessary consequence of preceding debility or arrest of customary movement; for, without stimulation of some form or other, the debilitated subject would not, and could not in the nature of things, be supposed to change his position. Appearances are often equivocal as viewed in the series of animal actions; and here it is necessary to separate the sensation of want, which is stimulant of action, from the sense of debility, which is negative of effect. These may be connected contingently, but they are radically distinct in their natures; and, though we see no evidence in fact, and cannot, consistently with our observation of the laws of organic mechanism, suppose any condition of debility to be in itself an immediate cause of spasm in the same series of parts in which the debility exists, it is not difficult to conceive how debility or impaired action may follow as its effect. It is obvious, that vigorous health consists in action and relaxation from action of a given extent and regular cadence; that disease, particularly the disease termed fever, ordinarily manifests spasms and abatements from spasm, that is, constriction and relaxation,—irregular and uncertain in time, force and compass. The tenor of the action is thus changed, and its force may be defective contingently. The functions which depend on that action, and which express strength and power, may be, and are in fact necessarily disturbed, even in some degree paralysed. Debility may therefore follow, and often does follow as a consequence of spasm: it is incongruous in reason to suppose that it should precede as a direct and necessary cause; for it is admitted that spasm is action, and that debility is want of power to produce action. But, as the actual existence of spasm or constriction is often evident in fever, however we may doubt concerning the cause which produces it, it is added, that "*hence follow an accumulation of blood on the heart and lungs, the re-action of these organs,—the generation of morbid heat and morbid association.*" The steps now noticed, as well as the preceding, appear to me to be assumed without sufficient evidence of connection with the supposed cause. I observed above that spasm may be a contingent, but that it is not a necessary consequence of debility, even if debility be admitted to exist as the base of febrile action; in a similar manner, I trust, I shall be able to satisfy the reader

Increased action.

that, though spasm or constriction of the capillary system may be actually present at an early stage of fever, it does not imply increased action of the heart and augmentation of animal heat among its indispensable consequences. We suppose, and the supposition is reasonable in the strictest view of the case, that, if the quantity of the circulating blood be diminished in the surface, or rather in the capillary vessels through the whole organic structure of the body by this act of general spasm or constriction, the sphere of the circulation is necessarily contracted ; hence accumulation in the greater or more capacious trunks is the obvious consequence of the constriction. This may be admitted as a fact. The blood is accumulated upon the heart; yet it does not thence follow that the heart or centre of circulation re-acts as if stimulated by the weight or impulse of this pressure. The cause is present in many cases ; the effect is not perceived in all : and, if this be so, we cannot be warranted in maintaining the conclusion implied in this explanation of the febrile process. In short, we observe in many instances that the surface of the body shrinks as contracted by the application of external or other causes. The blood is then supposed to be compressed in the interior or great vessels of the trunk, and to press with accumulated weight upon the heart ; yet we know that this compression may be strong, and continue for hours with nearly the same degree of force, without giving rise to what can be termed re-action of the heart. The heart is indeed pressed,—and it suffers; but it does not appear to re-act till some change is effected in the form and disposition of the compressing or constrictive cause which occasions the accumulation. When the pressure remits, in whatever manner that remission be effected, the repressed circulation endeavours to expand as if to recover its former boundary; and, in this endeavour, is implied increased action of the heart, communicated to the channels of circulation through their whole extent. This occurs frequently in the history of animal economy, and it is illustrated very satisfactorily in the instance of exposure to external cold. When cold is applied to the living body in an uniform manner and for a length of time, the blood, as repressed from the surface by the action of this cause, is accumulated in the interior; yet though this be so, we do not observe that the heart is moved to stronger and more frequent action during the uniform continuance of compression: it begins to move more rapidly, and to act more strongly as the compressing cause is changed in its mode of application, diminished in degree, or altogether withdrawn. This is visible; and from this it is fair to conclude that the cause of the increased action of the heart, which obtains in the early stages of fever, is not to be placed to the account of simple weight of accumulated blood in the heart, and lungs and larger vessels. Another condition is necessary to produce this effect: I do not pretend to say what it is; but this much may be said that the motion of the heart is disturbed as soon as the spasm of the surface is cognisable by our senses; and that a change in the force and tenor of its action is evident before the blood can be supposed to be accumulated upon it by the effect of exterior constriction. Constriction of the surface must be supposed to produce its effect upon the heart by the slow progress of a regular hydraulic law; here the disturbance produced in the action of the heart is sometimes instantaneous as lightning: it even obtains where no accumulation as a consequence of previous constriction can be traced. The effect then, according to this view of the case, is not inseparably connected with its supposed cause; and hence we cannot avoid the conclusion that the cause here assigned is not the true one; for the law of animal action, like every other law within the circle of the universe, exhibits no anomaly, if we know the real base on which it rests.

But if the condition termed increased action be not, as has been stated, a natural and necessary consequence of spasm or constriction; so the evolution of heat, in increased quantity, is not uniformly and necessarily a consequence of the increased rapidity or force of the action here implied. It is indeed admitted that increased heat is often connected with a preternaturally active condition of the circulating system; yet exceptions present themselves every day in our experience which seem to prove that the extrication of heat, or balance of temperature, is not entirely a product of circulation as judged by the visible appearances of things; in short, that temperature is not regulated solely by the changes which take place in the action of the heart and pulses of the arteries, according to any measure which we are capable of applying to them. The temperature, for instance, is often high where the heart and arteries beat quickly, but not strongly,—of which scarlet fever furnishes a good illustration. It is low, even below the standard of health, where action is indeed weak or of small compass, but where it is so rapidly repeated that the intervals can scarcely be discerned, as in some instances of fever termed nervous. It is low, considerably lower than natural, —even approaching to an icy coldness, where the pulse is apparently little affected, or where it is affected after a manner the nature of which we cannot estimate, as is now and then observed in fe-

Heat.

vers of an anomalous or malignant character. It rarely rises very high in fevers of the periodic class, though the arterial pulsations are sometimes inordinately strong and highly expanded. It is sometimes ardent, pungent, and glowing, where the heart beats with no unusual force, and where its motions are not unusually rapid, as happens frequently among fevers which arise in crowded sick-wards and other infected places. These appearances, and many others of a similar kind, force us to conclude that there is something in the process which evolves animal heat and influences the changes in its quantity, so often noticed in fever, which we cannot pretend to explain. It neither depends upon the simple force with which the heart contracts and the arteries beat, nor on the frequent repetition of their motions. If there be impulse from the action of the heart, there is something of figure given to the action by the temporary disposition of the organ which manifests the effect. This is unknown, unappreciable by our senses; and we incur the almost certain chance of error if we attempt to explain it.

Association.

The *morbid association*, the last link in the chain of the febrile process, is said to be the product of increased heat, as increased heat is held to be the product of accumulation of blood in the interior; accumulation of blood, the product of spasm of the surface; spasm, the product of debility; and debility, the product or first step in the operation of the remote cause producing fevers. I have shewn, and I am inclined to believe to the conviction of the reader, that the preceding links of this chain are not well connected; that is, that they do not stand in the necessary relation of cause and effect with each other. This last, viz. the morbid association, is even more equivocal than any of the others :—the term itself is not free from ambiguity. If it be employed to mean a consent of suffering between different parts or organs of the system, as influenced by the action of disease; such consent or association, I may add, is discoverable at an early period, even at a period when the increased action of the heat has not yet established its own dominion, much less engendered a dependent. If it mean that distinctive form of movement which belongs to the febrile circle, which has its beginning, its increase, its acmé or highest point, its decline and critical termination; such association is sometimes formed without the presence of increased heat: and it often persists in its course or habit after the increase has subsided, nay even after the heat has fallen below its natural standard. It is evident in this case that, if increased heat be held to be the source of the morbid association, the effect arises without the presence of the cause, which is absurd; or it continues in force after the cause is withdrawn, which is a position to which we cannot readily give assent.

Such is Dr Currie's explanation of the mechanism of the febrile process, and such are some of the objections which appear to me to render it inadmissible. The base is hypothetical, and even the subsequent steps do not proceed legitimately according to a regular series of cause and effect.

General remark.

Cause and effect are expected to bear proportion to each other, or to be modified in their varying proportions by something that is visible and appreciable. If fever exist, and if signs of debility be not perceptible by our senses previously to the manifest increased action of the heart and arteries which constitutes the ostensible disease, and of this there occur instances in the experience of almost every one, we are not warranted to assume debility as the indispensable cause of the existing condition. And further, if spasm exist without producing increased general action, or if increased general action exist without producing increased heat, our series is broken, and we only get out of our difficulties by supposing something peculiar, which is in fact a tacit confession that we do not know the true cause upon which the operation depends. A general acquaintance with the history of fever proves indisputably that the symptoms, or as they are called links in the chain of the febrile process, do not bear a regular and determinate proportion to each other, even that they do not observe uniformly the order of succession that is here systematically assigned to them. The example of the paroxysm of regular intermittent, which is selected and detailed in the Reports as illustrative of the theory of fever, is very correctly described; and, if no anomaly existed any where, we might be induced to give our assent to the explanation afforded by it, though the proof of its truth were not demonstrated: but anomalies, as has been already remarked, are numerous; and anomalies, I am bold to maintain, do not exist in the law of Nature: they have their existence only in our ignorance of the base of the action; and where they appear, as they do in the case before us, we must unavoidably conclude that we have not penetrated to a knowledge of the point on which the foundation of the process rests.

Effect of the theory on the plan of cure.

But, while the theory now exhibited is unsatisfactory, as insufficient to explain the important process which comprises the history of fever, it furnishes no consistent view, or safe ground on which to form a plan of cure. The symptoms, or links of the febrile chain enumerated above, are apparently very different in their nature from each other; and so, I add, must be the means employed to oppose their progress, to moderate their excesses, or to subvert their foundations; and thus more slowly or more abruptly to effect the cure of the disease. If these symptoms be considered collectively as connected parts of the same operation, the plan of cure founded on this view will be often embarrassed in its progress by fluctuating appearances which are contingently joined to each other in the febrile series, and which interchange with each other suddenly and often unexpectedly by the action of seemingly slight causes. The physician, who views the paroxysm of fever as a series of causes and effects mutually and indispensably connected with each other, is placed in a difficult situation. He is like the mariner who navigates between Scylla and Charybdis, and who sits inactive leaving his vessel to its fate, or who veers, with fear and trembling, from right to left, and from left to right, between shoals and whirlpools,—in danger of falling into a gulf on one hand, or of driving against a rock on the other; that is, of carrying his patient from debility to dangerous excitement, or from excitement to the lowest point of debility. Such must be his fears,—and such in reality will be his act if he mistake his means or miscalculate their force. The febrile process, according to the view of the author of the Medical Reports, is supposed to proceed in a connected chain from debility to increased heat, one link following another as a necessary consequence, one part being of course a remedy or cure for another. If this view were correct, the febrile process might be expected to be the same in all cases; for, as one series of action arrives at a given point, another, which is a counter-action considered as the remedy of the error of the preceding, commences its course, and proceeds forward till it reach another given point, when it is also relieved by its counterpart; and so on, till the febrile or diseased action is brought through a series of links to the order, regularity, and energy of the action which belongs to health. Under this supposition there is a *vis medicatrix naturæ* inherent constitutionally in the system. If there be in fact such a law, we must suppose it to be a perfect one; for, as the design is contrived by infinite knowledge and executed by infinite power, it is impossible it should be otherwise than perfect. The course is supposed to be salutary; it notwithstanding often errs, or the effect often fails. This is obvious; and hence, we cannot suppose the perfect purpose to be comprehended in the mechanism of the structure; for no defect, error, or imperfection exists in the works of Nature if we judge them by the rule according to which they are formed. The symptoms or links now noticed, and which are considered as necessarily connected with each other, that is, as standing in the relation of cause and effect, actually do exist; but though they exist they can only be held to be contingent, for they do not uniformly observe the same place in the chain: they do not uniformly bear the same proportion to each other, and they do not uniformly produce the same effect, or exert the same power in rectifying the disturbed actions of the system,—all which they ought to do if such was the systematic design of Nature. Hence this view of the theory of fever furnishes only a fluctuating and uncertain rule of practice; for causes and effects are so mixed that we sometimes do not well know to which we ought to direct our attention, whether to debility, to spasm, to increased action, or to increased heat. As the rule of practice originating in this source is fluctuating, so it must be allowed to be feeble, unless we transgress its sanctioned bounds; for it cannot be supposed, strictly speaking, to go farther than to regulate the excesses, or the defects of action: it does not warrant the attempt of arresting the course abruptly by strong means, for the proceeding of Nature is deemed to be radically a salutary one.

As the febrile process is held to consist in a series of actions connected necessarily with each other as cause and effect, it follows of course that if these actions proceed in just order, the disease attains its termination fortunately by the design of Nature, that is, through a mechanical process of the animal economy. The physician observes the proceeding; he adds, or he takes away according as defect or excess manifest themselves; and he thus assists, whether he excite or repress; but he does not venture to subvert, or decidedly to interrupt the course of the operation; for that, according to his view, must be considered as salutary in itself, —its errors only dangerous or pernicious. This conclusion arises naturally as a consequence of the theory which considers the enumerated symptoms as necessary links in the febrile chain,—genuine causes and effects of each other; and which, however modified and explained, must be considered as resting ultimately on the existence of a *vis medicatrix naturæ.* The theory of the mechanism of the febrile process alluded to in this place is of the character described, and, left to its own genuine operation, it must necessarily produce a fluctuating plan of cure, liable to change as the appearance among the symptoms change; while it does not perhaps, consistently with its principle, allow us so to act as forcibly to arrest the disease by the application of means which excite an entire new train of movement through the whole extent of the organic system. But, while the principle of the theory naturally begets a fluctuating plan of cure, it is customary with practitioners to fix the attention upon one or other of the leading symptoms, by means of which the view is directed through the whole practical operation. We thus find that there are some who consider debility, not only as the first step in the febrile process, but as the predominant character throughout the disease. It is evident that with such, stimulation of one kind or other must be supposed to form the genuine means of cure. There are others who give the same pre-eminence to spasm; consequently antispasmodics are the principal remedies in which they trust. The doctrine of increased action of the vascular system also has its votaries; and, with such, the means which diminish or moderate the force of the circulation are chiefly resorted to; while some, and among these the author of the Medical Reports, give a great importance to the presence of increased heat, the reduction or subtraction of which calls for the application of powers directly refrigerating in themselves.—As it is evident that, if the practical act be directed by a consideration of this view of the febrile process, it must be fluctuating and even feeble; so, if directed by the presence of any one of the symptoms now enumerated, it must be limited in its application, as circumscribed by conditions which are by no means constant in their appearance.

The practical rule of the author of the Medical Reports, as regulated by the presence of a partial condition, is evidently a circumscribed one; but, as that condition is represented to be the parent of the morbid association, and as it is regarded not only as an essential link in the chain of the febrile circle, but as the point which determines the nature and regulates the application of the cold water to the surface, this implied condition, or increased heat being moreover measured by the help of an artificial instrument which precludes the chances of deception which might arise from sensation, the manner of treating fever appears to be brought to such mathematical precision that even the ignorant can scarcely be supposed to err in the execution of the purpose; hence the introduction of the thermometer is hailed as an important discovery. As increased heat or high temperature is held, in Dr Currie's opinion, to be the condition upon which the continuance or duration of fever depends, the subtraction or reduction of that increase, the foundation on which the means of cure, viz. the affusion of cold water on the surface, operates, it is evident that increased heat is the cause in error; and, as that cause can only be supposed to be subtracted where it is in error, or more strictly where it abounds in excess, it follows by consequence that the application of the remedy is directly limited to that condition of disease where morbid heat is plainly manifested through the whole extent of the system; and accordingly, the radical rule for warranting the affusion of cold water inculcated in the Medical Reports is thus defined: "*When there is no sense of chilliness present, and when the heat of the surface is steadily above what is natural, and when there is no general and profuse perspiration.*" The existence of increased heat, the circumstance which sanctions the application of cold water to the surface, is supposed to be judged by the help of a thermometer, and the employment of that instrument for the direction of our judgment in this case is thought, by many, to give an otherwise unattainable precision to the practice of affusion. Our information is however as yet very imperfect on this head; for, if we submit to be guided by the measure of quantities merely, and act under the idea of subtracting excess of heat so as to produce a just level of temperature by measure, it is reasonable to suppose that the forces of the agent and subject ought to be always correctly measured, in the view that the mean attained be exactly that which is wanted. If, for instance, the heat of the subject, measured at the axilla or under the tongue, be 103 of Fahrenheit's thermometer, we ought to know precisely how many gallons of cold water, at any given temperature, will bring the increased heat to the just and regular temperature of health; or, if the heat stand at 106, or any other given degree, we are in a similar manner supposed to know the precise measure of the means to be employed, viz. the quantity and temperature of the water required to produce the just effect, and nothing more. This can be ascertained only by experiment; and if we believe in this rule, it is necessary that its existence should be ascertained; for, if the principle of subtraction here assumed be sole and fundamental,—not accessory and contingent, we cannot refuse the conclusion that, if the water affused be deficient in quantity, or in degree of cold relatively to the case, the heat will not be subtracted, and the disease of course will not be arrested; on the other hand, if it exceed, the heat may be subtracted beyond the safe point; life may even be extinguished by the means which are employed as a remedy of cure. This is a legitimate deduction from the supposition that the cold affusion acts generally and fundamentally by subtraction. Hence, as I said before, if we act on this ground, we ought to ascertain the temperature of the agent, as well as the temperature of the subject in all its varying extent by the most precise thermometrical observation. We ought also to measure the quantity of the means correctly, and observe the utmost exactness in the manner of applying them; for otherwise we incur danger, or we apply our remedy to no purpose. This precision, essential as it would appear to be for correct effect, is not sufficiently marked in the Medical Reports. Hence, I think we are warranted to say that thermometrical practice is still imperfect, if we suppose the affusion of cold water to act by the subtraction of heat; but I at the same time affirm that thermometrical observation is superfluous, if we believe the remedy to act by impression, implying among its consequences a new form of action analogous with that which obtains in health. This part of the subject will be more fully discussed in the sequel; in the mean time I may observe that, if the temperature of subject, the temperature of water, and the quantity of water affused be precisely the same in two different cases, and yet the effect produced be not precisely the same, we are driven to the necessity of placing the principle, through which the effect is attained, to something else than the simple subtraction of heat; consequently we must look for some other guide to direct us in our course besides simple thermometrical observation.

But, while I speak in this manner concerning the deficiencies of the practical rule for measuring and estimating the means relatively to the condition of the subject, I have farther to observe that the remedy, as permitted to be employed only in the case of increased heat, is withheld from many important conditions of fever where it might otherwise be employed with advantage. The establishment of the full dominion of febrile heat through the whole extent of the system and its manifestation on the surface more especially do not occur, according to the theory alluded to above, till after some continuance of increased action; increased action, till after the formation of general spasm or constriction; and spasm, as is commonly known, is held to be the consequence of debility. According to this view of the process, which is the view presented in the Medical Reports, all the dangers which belong to debility, to spasm, or to increased action, and they are not of small account, may be supposed to pass on without control till the period of increased heat arrives, for it is the presence of that symptom only which lays the case open to the action of cold affusion. The employment of this remedy then, as connected with the view of the author of the Medical Reports, is limited and partial; for, as it cannot be applied without the presence of increased heat, and as increased heat is not always present, and in some cases can scarcely be said to exist at any time in the course of the fever, the cold affusion has no place; or, it is applied in contradiction of the rule, and, if the doctrine be true, not without danger of life. The real state of the fact will be explained more fully hereafter; in the mean time, it is proper that I place before the reader a view of the restrictions or cautions which Dr Currie subjoins to his general precept. In the first place then he forbids the employment of cold affusion "*in the cold stage of the paroxysm of fever;*" 2dly, When "*the heat as measured by the thermometer is less than, or even only equal to the natural heat, though the patient should feel no degree of chilliness;* 3dly, *Under profuse perspiration;*" and he further recommends that, "*when it is employed in the advanced stages of fever, where the heat is reduced and the debility great, some cordial should be given immediately after it, and the best is warm wine.*" He also adds, that "*the presence of severe diarrhœa or dysentery seems to forbid the use of the cold affusion, or at least to render its advantages uncertain,*" vol. i. p. 20. An exception is also made against its being employed in the "*latter end of fever when the strength is much exhausted, and the heat is some times as low or lower than the temperature of health,*" vol. i. p. 42. "*In fevers accompanied* *by, or originating in high local inflammation, which are generally attended by a great disposition to chilliness, he does not depend on, or recommend the use of affusion, cold or tepid,*" vol. ii. p. 3. The above, as far as I have observed, are the principal restrictions respecting the application of cold water to the surface made by the author of the Medical Reports. Increased heat of the surface is the leading circumstance which commands the use of the remedy;—a sense of chilliness, though heat higher than natural as measured by the thermometer actually exist, forbids it; as also do profuse perspiration and high local inflammation.

Author's view of fever.

I have endeavoured, in the preceding pages, to give a summary view of Dr Currie's theory of fever, and of the principle which directs his practice in the affusion of cold water on the surface, as a remedy for the cure of that disease. I shall now state, as briefly as I can, the opinion on these points which may be thought to be more peculiarly my own. As I see that the theoretical errors of my predecessors have arisen principally from the desire of explaining more than man can be supposed to know, I confine my view to a humbler sphere, directing my attention to the observation of the movements of animal life, endeavouring to note actions in their rise as moved by the impulse of external causes, and to trace them in their progress as connected relatively, and propagated consecutively through the various subordinate series of parts or organs which constitute the entire or perfect animal system. Assuming in this manner the office of a mere observer, I refrain from hazarding opinion concerning the intimate nature of the instruments through which the Author of our being accomplishes his purposes, in giving effect to that train of action which maintains the economy of our frame, or which disturbs its healthy operations :—these are inscrutable. We cannot pass with safety beyond the visible point ; and we are even exposed to delusion within the circle of our vision. It is therefore necessary to proceed with caution, to exclude the operations of imagination, and to endeavour to arrange the phenomena which present themselves in the course of disease by their direct and intimate relations. A work, which assumes this ground for the limit of its range, may be less amusing than that which indulges in conjecture, but it has the chance of being more useful to those who seek principally for practical information.

In proceeding to consider this part of the subject, it is necessary to remark in the first place that the human body, after it has attained a given state of maturity, consists of a congeries of organs of various structure and function, each part differing from another in nature and office, but all connected by mutual relation with each other, and individually so arranged and disposed in their places as to form an entire and independent system, capable of assimilating, through the creative power of its organs, a multitude of heterogeneous matters to its uses, and of supporting itself in health and vigour in consequence of the qualities of its organization through a wide range of varying condition. This congeries of parts, which constitutes a system or whole, and which is so wonderful and varied in its structure, so admirably combined and artfully connected through all its extent, is liable to be moved generally and relatively by the impulse of a common cause, and to give out, when so moved, an infinity of product, modified variously according to the laws of a varied organization for the numerous purposes of the living subject. It is a visible and self-evident truth that animal action follows as an effect of impulse or stimulation applied to organized animated matter; and it is further demonstrable that the performance of a specific office, or the execution of a defined function follows as the effect of action in a body which is regularly organized. A just proportion of the cause of stimulation, applied to a body that is justly organized and duly animated with the material of life, produces a justly balanced action, continued successively through all the minuter as well as greater organs of the connection in regular and orderly movement. As the movement here implied is supported by the regular and successive application of the impulse of stimulation, and as that cause is liable to be increased, diminished, or changed in its nature by the ordinary contingencies to which the life of man is exposed; so the consequent action is liable to be increased or diminished in frequency and force,—in part or in the whole: it is even liable to be changed or perverted, so as to constitute disease, subverted or annulled, so as to occasion death. As physical health consists in the just action and correct correspondence of duly-proportioned movement among all the parts and organs which compose the animal system; so error in action, either by excess, defect, or perversion, producing irregularity of correspondence in the movement of the subordinate parts, constitutes disease. The foundations and efficiency of health consist in the perfection of the condition of the subject with the just proportion of the cause of stimulation; the foundation and existence of disease in the imperfect condition of subject under the customary forms of stimulation; or, in error in quantity, or change in quality of the matter of stimulation where the subject is without fault. It is evident that the concurrence of these circumstances, viz. error in the subject acted upon, or in the cause which moves the action, cannot do otherwise than occasion a new or changed condition of movement in the functions of the animal body, disorder its economy, and thus produce disease. The action is changed variously according to circumstances; it is sometimes local, sometimes general, and it is mixed in various degrees, the movement accelerated or retarded at various rates. Among these perverted forms, the disease termed Fever holds a principal place. The action is here changed generally, all and every function of the body being affected in a greater or lesser degree, but frequently in a very different manner in different subjects, even in the same subject according to different circumstances in which he may be placed.

The present work, the professed object of which is the exposition of rules for applying cold water to the surface as a remedy for the cure of fever, does not comprehend in its view a detail of the history of the malady itself. That is supposed to be already known to the reader; hence, those circumstances only which are more immediately connected with the application of the remedy require to be noticed in this place. The history of fever has filled more volumes than the history of any other disease which afflicts mankind; yet the ingenuity of physicians has not hitherto discovered characters in the action of a febrile cause, which define fever comprehensively, and at the same time precisely from all other forms of disturbed health.

Definition of fever.

The definition of the febrile class, viz. *post horrorem, pulsus frequens, viribus artuum imminutis,* marks the presence of a febrile action; and it does it so far correctly that, wherever such condition is present, we are warranted to say that fever exists; but, while I admit this, I must at the same time remark that the definition is not comprehensive; for the action of a febrile cause may, and actually does, exist in the system without the conditions here implied being present. Fever, at least a derangement of healthy action proceeding from a known febrile source, sometimes arises without a perceptible sense of cold; it may go on without perceptible increased frequency of pulse; and, in some cases, it appears to be present without the vigour of the limbs being sensibly impaired. Hence, though the definition stated marks the presence of fever; yet, as fever may exist without the characters of this definition being perceptible, it is evidently imperfect. On the contrary, if we define fever to consist in a changed or perverted motion,

—a new form of action manifested in the organic instruments of the animal system, we include the extent of the action of the febrile cause; but we do not precisely define the disease so as to discriminate it from all others. The term changed action is general and not sufficiently descriptive of character; for action may be changed from the healthy tenor by increase, by decrease, or by various forms of perversion. It is thus observable, that actions which arise from the impressions of a febrile cause are so extremely varied that, of a thousand persons exposed to the same source of disease, there probably scarcely occur two where the symptoms are precisely alike in force and form in all their parts. The cause is the same, the disease is fundamentally the same; yet shades of difference in the effect are visible in every separate individual. Where the moving cause is apparently one, the consequent form of action is sometimes increased in force, sometimes diminished, and sometimes variously mixed—irregularly excited, or irregularly depressed below the just level. This is a fact, which those conversant with febrile diseases have frequent opportunities of remarking. I do not pretend to explain its nature; I only suggest that the irritable or non-irritable condition of subject, on which we suppose this variety to depend, appears to have some analogy with what is termed positive and negative, or *plus* and *minus* in *electrics;* while the train of phenomena, or series of motions which fever exhibits, is totally different from motions which proceed according to a common mechanical law. They sometimes move rapidly as lightning from a given point to every fibre of the frame; sometimes they proceed by a slow course. They cease or disappear, and they again recur at a given hour, and in such a manner as to give grounds to believe that there is a rising and falling in the irritable condition of the animal frame which modifies the appearance alluded to;—it has its rules, but they are too mysterious to be explained. The form of action in fever is changed throughout the whole organic system; of course, the whole series of secretions and excretions, absorptions and exhalations is necessarily changed. It is however to be remembered that, though the change be general, it is often, indeed usually more conspicuous in one part than in others: hence effect is destructive locally, or the subject dies in parts.

It is a matter of fact, placed within the view and comprehension of the common observer, that a due proportion of stimulating power, applied to a subject constituted with due vigour of life through the whole extent of the system, maintains the whole series of animal action in the just order of

Cause of fever and general principle of cure.

health; so, it follows as a natural consequence by analogy in reasoning, and it is proved to be true in experience that, an increased proportion of the same cause accelerates the action in point of time, or augments it in measure of force; an excessive proportion accelerates it beyond the order, or augments it beyond the degree which is consistent with health; while the admixture of matters of a foreign nature irritates it—even to subversion, producing change in the tenor of movement, or suspension of just progress in the functions—in part or in the whole—and ultimately death. The disease termed fever, the cure of which forms the subject of this Exposition, presents a change in the condition of organic action through the whole extent of the system,—differently proportioned, however, in each organ according to a number of varying conditions. This action, whether accelerated or retarded in time, increased or diminished in force, is changed in manner,—perverted in some shape or other from its customary form and tenor, and moulded into a new figure, which has its own law of proceeding and which produces its own effect, which is an effect subversive of health and sometimes destructive of life. As it is evident to the simplest understanding that organic action is not, and cannot be produced without an impulse of direct stimulation, or change of condition in subject which amounts to stimulation; so, it is equally clear, and supported on similar grounds, that no action or circle of actions, when moved into this artificial train and maintained in it in the manner implied, can be supposed to be checked or controlled in the vigour of its course, without an act of impression from a cause of a new and contrary nature to that which moved it originally, and which still continues to support it. And farther, as the power of the cause which moves the act must, in all cases, be proportionate to the needs of the occasion, it presents itself, as an obvious inference from the supposition, that the leading indication for the cure of fever must necessarily consist in the adjustment and application of a remedy of a stronger power of impression than that of the morbid cause; and which, while stronger in power, is at the same time so constituted in its nature that, while it acts by arresting the cause of the disturbed and perverted movement in which the disease consists, it may also, by a mode of impression connected with its properties, move the parts into such particular form of contact as to favour the commencement of actions analogous with those which obtain in health; at least, it may be supposed to produce, in consequence of the arrest alluded to, such a state of balance in the conditions of the subject that the powers, which stimulate action in its healthy forms and which maintain it in vigour in ordinary circumstances, may be so presented and so received in the case in question as to exert their force without impediment and without hindrance; consequently, may be so directed as to restore the customary train of action in all its extent, and to support it in all its parts with vigour. As it is evident that, when the condition of the subject and the power of the agent are justly balanced, the movements are regular and such as are deemed healthy; so, when these are changed, or not duly poised, irregularity arises and disease is the consequence. If this position be admitted, it follows in consequence that the first step in instituting the plan of cure must be directed to restore that equipoise, or just susceptibility of impression, which appears to be overturned or absorbed in the existence of a foreign action. This purpose is attempted by a variety of means: it may for the most part be accomplished by a very few; I shall notice the principal of these, after having called the reader's attention to a consideration of the sources from which fever appears to arise.

Distinction of cause.

General fever usually draws its origin from two common sources, different in their nature from each other; viz. one endemic, the product of matters which are common to the surface of the earth and which diffuse themselves widely in the air;

the other, circumscribed in its sphere and artificial in its origin, generated evidently through the faulty combinations which obtain in political institutions, whether in want of knowledge and foresight, or in indifference to public good. The operation of this artificial cause of fever produces misery and sometimes great havock among the human race; but, as the effect is ordinarily manifested upon the low and mechanical part of society, which abounding in the world to excess is generally reckoned refuse, the rule of prevention rarely engages the legislative attention of nations. The nature of the disease, thus generated artificially by mismanagement or neglect, is infectious in its character. It propagates its kind by communication, and thus expands its circle; but its cause does not diffuse itself widely in the air so as to become epidemic. It is not a form of disease of much inherent mortality: it notwithstanding sometimes commits destructive ravages, particularly in armies; for it is liable to be acted upon and aggravated in degree by a multitude of accidental causes which are not easily avoided, or which those in power view with unconcern. It arises where men are accumulated unduly in limited space, or in ill-ventilated apartments; it is evidently aggravated in degree under such circumstances; it is weakened, and it even disappears where these aggregations or accumulated sources are diffused in a wide atmosphere. But, though the artificial infectious fever as communicated from person to person can scarcely be expected to become widely epidemic, I must at the same time observe that there exist certain conditions of the atmosphere under which it is more easily communicated than in others, that is, where it spreads rapidly to a comparatively wide extent. There are others again where it is communicated with difficulty, even where the cause is present in force; and where the subject cannot be supposed to be constitutionally unsusceptible of its impression. We cannot venture to say precisely what these are; but we find the first frequently, though not uniformly connected with close, damp, and foggy weather; the latter with hot, pure, and dry air.

Distinction of form.

The cause of fever has thus two general sources; the effect or disease has two general forms, the differences of which are notwithstanding sometimes discriminated with difficulty from each other. The infectious, as is generally known, is produced artificially: the endemic belongs to the extended surface of the globe, modified however by climate, by situation of place, and by season of the year. It is sometimes widely diffused, though mild and simple in its character; sometimes, while widely diffused, it shews something peculiar, an epidemic cause modifying the form, and stamping upon it a pestilential virulence. It usually has its own period of duration: this shews clearly that it is more connected with natural than with artificial causes. It may become infectious by accumulating the sick together;—it is not so at its original source:—the history of all epidemics which have been traced with any accuracy proves this truth.

Outline of difference in form of action according to cause.

But, while the sources of general fever are different as has been stated, as well as the form which the cause, as it passes into action, usually assumes; so the endemic, whether periodic or continued, is usually observed to be accompanied with marks of stronger commotion in the circulating system than the infectious; and, as the force of action in the circulating system is there more evidently increased, so open crisis, or termination by evacuation, viz. by the skin or some other secreting organ, is there more common. Local oppressions, inflammations, or congestions are likewise oftener present as primary or early symptoms; and hence, the disease is often more complicated in its nature, its cure of course more difficult. In the infectious, the febrile movement is often such as may be called light or superficial : the form of action fluctuates and changes : there is rarely any permanent local affection of internal organs as a primary symptom : the action of the heart and pulses of the arteries, though often rapid and quick, is less vigorous and forcible ; and, apparently as a consequence of this condition of the circulation, termination by means of copious critical evacuations is less common than in the endemic. Where the epidemic cause is added to the endemic, or when an epidemic constitution of season supervenes where an infectious fever already exists, the product or disease is modified peculiarly so as frequently to assume the gangrenous character, the complicated and anomalous form. Here the dangers are greatly increased, and the management of the means of cure is rendered vastly more difficult.

Duty of the physician.

Such is the disease, I must now say how it is to be met. It is evidently the first view with the physician, who acts conscientiously, to accomplish his purpose safely and speedily ; that is, to arrest the destructive progress abruptly by the application of means which are safe in themselves, or which are employed with caution if they be of powerful effect. The condition of fever is sometimes complicated; consequently the just application of the means of cure is occasionally a matter of great nicety. It is in fact so difficult in many instances, that the final purpose cannot be attained safely or effectively, without a most correct and scrupulous attention to a variety of relative circumstances which present themselves contingently under the action of medical administration; and, for this reason, it is essentially necessary that the physician himself administer remedies, or that he superintend administration in all important cases in order that he may thereby judge of changes as they arise, and stop progress when the end is attained; but not till then, if he be assured, as he ought to be before he begins to act, that the ground on which he treads is sure. It is from this attention to circumstances only, viz. from witnessing every step of the process and estimating the relative progression among changes as they occur, that we are enabled to calculate final success with any degree of certainty; for the medical art has not yet attained, and perhaps never will attain so great precision in application, that a physician shall be enabled to judge *à priori*, and thus commit to his prescription-book the exact quantity of blood for instance, which, subtracted from a vein in a given time, will infallibly produce a given effect. The effect often depends on something that is not precisely measurable without trial; and, if the measure assumed fall short of what is right, the end is not attained; if it exceed, life is probably brought into danger.

It must be admitted that if a person, whether a surgeon or apothecary, be ordered to execute or administer, he cannot be supposed to use his own discretion in the act. He merely executes a command; and, if any circumstances exist in the case which have not been foreseen by the physician, and no candid man will say that such do not often exist, he executes it at the risk of the patient's life. Failures happen often from this cause, and even sometimes dangers; and therefore I cannot dismiss the subject, without inculcating, in the most earnest manner, that the person, who is seriously interested for the safety and welfare of those intrusted to his care, attend himself to the administration of the means of cure, even that he actually regulate, by his presence and inspection, the effect of all important operations, whether bleeding or others which produce immediate and great changes in the state of the system; for it is better that, even as physician, he save the life of one man by the close attention to administration here enjoined, than that he prescribe for twenty and leave the execution to chances of error.

As the exposition of principle is antecedent in a systematic work to the exhibition of practice; so principle, if sound in itself, furnishes a foundation for the physician on which to act safely and efficiently, even where no precise example of similarity stands on record. It is assumed for instance as a fundamental position, and the truth of it is self-evident, that the organic actions of the animal system are moved by impulses of stimulation; and, this being admitted, it follows by natural consequence, that the actions so produced necessarily maintain a just proportion with the quantity and quality of the cause of the stimulation, the susceptibility and capacity of expression in the subject acted upon. It is in the just balance of stimulating powers, comparatively with the acting capacities of subject, that the rule of animal health consists; change or perversion of these conditions, however produced, constitutes disease. As the sum of health consists in justly regulated action, disease in its perversion; so the aim of the medical art, as professing a purpose of rectifying error, is reasonably supposed to be directed to the end of arresting or controlling irregular action, of soliciting or producing that which is just and efficient; and further, when reproduced, of maintaining and supporting it in vigour and activity throughout the whole extent of function which obtains in the animal system. The existence of disease marks a condition in animal or organic action deviating from that which obtains in health; and that particular form of deviation, which characterizes fever, presents itself as an action changed by increase, by decrease, or by perversion throughout the whole organic system; in so much, that all the functions of the body are disturbed, though they are not all disturbed in the same degree. Sometimes the changed action is of one uniform tenor, and equally diffused in all parts; sometimes it is mixed, increased in one part and diminished in another; and thus irregular or complicated. In one case, the whole train of action is excited above the natural pitch; in another it is diminished or depressed below it: the character is thus varied; and we infer, as a consequence of this varied character, that the means employed for cure are to be varied in like manner. In simple forms, or where the diseased action is of one tenor and where it is uniformly diffused, a remedy of one character is often sufficient to effect the cure; where the action is irregular, as where the disease is complicated, a combination of remedies is generally required. But, in considering the action of remedies and the probable recovery of health, we are to bear in mind that, connected with a pure and well tempered atmosphere, there is constantly manifested the presence of an animating cause which stimulates life into action, and which moves and maintains it in due order and efficiency, where the organic power is entire and possessed of its due susceptibility of impression. Hence, where the perverted action which constitutes the disease has been arrested by a stronger impression than that which produced it, the susceptibility to the customary cause of stimulation is restored contingently, and healthy action probably resumes its course. This, if accomplished by one set of means, exhibits a view of the simplest process by which the cure of fever is effected. On the other hand, where the disease is complicated, the curative process is more complex; for here the complication must not only be unfolded, but the dormant, or suppressed susceptibility must often be rouzed by causes of analogous, but stronger power than those connected with the simple presence of the common principle, which, in ordinary conditions, stimulates the action of life. One of the most powerful of this class is the aspersion or affusion of cold water on the naked surface: the proper management of it forms the subject of this Exposition, and the mode through which it operates will I trust be soon made level to the reader's apprehension.

Preparation of subject.

As the disease termed fever exhibits marks of changed or perverted action throughout the whole organic system; and, as it is evident that when actions are increased in strength, perverted or changed in nature as a consequence of impressions to which the habit is not accustomed, all such causes of action as are familiar, or in themselves weak, are either not felt at all, or felt obscurely: they consequently produce little or no effect; hence the disease goes on to complete its circle unless arrested by a strong controlling power. Of controlling powers, the affusion of cold water on the naked surface is perhaps, as I have just now observed, the most decisive which the medical art acknowledges; but it is not decisive, or even safe in every condition of febrile disease. That we may apply it with safety and effect, the circumstances of the subject must be considered,—not superficially, but with minute attention, so that the preparatory means may be adapted correctly to the varying conditions of the case. The first and main point of the physician's concern regards the means of restoring susceptibility of impression. Susceptibility is in a manner lost or absorbed by the action of the disease: it is thus necessary that the course of the disease be arrested or moderated; and this is effected sometimes by means which act generally, sometimes by means which act in a manner locally according to the condition actually present. Of preparatory means, evacuation is the most effectual and important; and of evacuations, bleeding is that which first attracts our attention. In a disease, which exhibits marks of changed action in the vascular system, whether generally or locally, we have reason to expect a counterchange from the subtraction of blood. The effect of this process extends through the whole apparatus of circulation; and, as the channels of circulation extend to every fibre in the frame, the whole movements of animal and organic action are necessarily and even forcibly affected by it, particularly the function of absorption. It is thus observable that the subtraction of blood, in its grosser and more visible operation, removes direct impediment or obstruction in the organic extremities of the circulating system: it quickens the circulation where it is sluggish or suspended by oppression: it moderates it where unduly excited, restoring ease and tranquillity, and removing those causes of irritation which occasioned tumult and disorder: it arrests the irregular course, restores the lost susceptibility of impression, opens the sources of absorption; it, in fact, produces a new state of balance, and generates a disposition in the habit to assume a new form of movement when submitted to even slight causes of stimulation; it thus cures the disease of itself, or it prepares the fit condition for the application of other means by which it is safely cured, particularly for the affusion of cold water on the surface. The mode of conducting the operation, as well as the measure of the quantity of blood to be subtracted, may be reasonably supposed to vary according to the nature and circumstances of the subject and the form of his disease. This general rule may however be admitted that the evacuation be made suddenly, or from a large orifice in cases of strong and recent disease, and that it be continued with resolution till evidence present itself that the effect sought for is attained. If the febrile action be violent, the course rapid and precipitous, whether generally manifested through the whole circulating system, or more particularly exerted in any given part implying the condition termed inflammation, the effect is signal and decided. If the action be sluggish, the course impeded, the general functions impaired, or organs locally oppressed as if by congestion rather than active inflammation, the effects of bleeding are in like manner of great importance; they animate the circulation; the healthy action resumes its course, or it is easily induced to resume it by the application of other powers. Medical history furnishes numerous examples of the fact which I now state. I shall place such of them before the reader as will probably remove all doubt from his mind on this head.

Examples of the effects of bleeding.

Bleeding, particularly when performed at an early period of the disease and carried to a proper extent in quantity, is frequently observed to cut short the course of the most concentrated forms of the endemic fever of the West Indies by the effect of its own power solely; or, if it fail in effecting the full purpose now stated, it prepares the way for the operation of means which succeed in the most perfect manner in consequence of the change thus induced by the evacuation. I shall mention some examples from my own experience in proof of my assertion. In the year 1796, at a time when fever committed great havoc among the *Rohan and Hompesch Hussars*, who were stationed in the plain *Cul de Sac*, near *Port au Prince*, I repaired to *Croix des Bouquets*, as a central point from which I could superintend the medical concerns of the district with facility, and give occasional aid to the medical officers of the above-mentioned corps. I carried with me an hospital mate, an orderly dragoon, and a white servant,—all of them Europeans newly imported, and who had not yet experienced any sickness since their arrival in the country. In a fortnight after our arrival at *Croix des Bouquets,* the three persons alluded to were seized on the same day; and nearly at the same hour, with symptoms of ardent fever. They were all bled at the same time,—not by a formal measure of ounces in a prescription-book, but by the judgment which I formed of the effects as they arose under the operation. Relief was the object in view; and the object was attained before the operator was permitted to bind up the arm. These three persons,—the subjects of this experiment, were restored at once to perfect health; they continued in health till that day fortnight, when they were all again attacked with symptoms of a similar disease. I was that day absent at Port au Prince and did not see them till thirty hours after the attack: Nothing had been done in the interval; the fever was of the continued kind,—ardent and violent. The dragoon and servant were bled largely soon after I saw them; they were greatly relieved, but the disease was not arrested so abruptly as in the former experiment. The hospital mate was timorous and entreated that his arm might be bound up before he had lost ten ounces of blood. As I could not persist in acting contrary to the sense of a medical man who was himself the subject of the experiment, the arm was bound up with reluctance for he had as yet obtained no decided relief. The place where we were stationed afforded no proper accommodation for sick; the persons described were therefore put into a cart and conveyed to Port au Prince—distant about ten miles. I accompanied them myself, and I observed progress in recovery during the journey: the dragoon and servant were convalescent next day: the hospital mate was not materially better; the disease in short went through its course, and terminated at the usual critical period by regular crisis. The cases now described prove very clearly the power of bleeding as a remedy for the abrupt cure of the continued ardent fever of the West Indies. The fact is very decisive in itself; but it may be thought to be corroborated by the experience of Dr Moseley, who practised many years ago in the island of Jamaica *. It is also farther confirmed by the testimony of Galen, who employed the lancet with great freedom and great effect, even when the disease had advanced to a later period than in the instances adduced. I shall transcribe a case from this author in illustration: the practice is not only detailed distinctly, but the reasons for adopting it are stated explicitly. The fever was of the continued kind and of a strong character; the period at which the operation was performed the beginning of the third day.

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* See Moseley's Treatise on the Diseases of Tropical Climates, p. 427, second edition.

" *Wherefore* (says Galen) *I subtract blood with the express purpose of inducing fainting, taught, both by reason and experience, that bleeding is a sovereign remedy for the cure of continued fevers of concentrated force; in as much as the body, cooled in the act of fainting which this evacuation induces, passes suddenly to a condition new and opposite from that existing; neither will any one be able to find a practice more pleasant or more salutary, either to the patient himself or to the physical power which maintains his economy than the one in question; for, when a subject is brought to this point of balance, evacuations by stool, even sometimes vomitings of bile follow necessarily as a consequence of the condition induced; to which a general moisture or copious sweat instantly succeeds,—all which, happening in their order in the present case, extinguished the fever abruptly; in so much that some of the bystanders called out,* bravo, *you have knocked the fever on the head* *."

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* Αφαιρω τοινυν εξεπιτηδες, ὥς λειποθυμιαν επιγενεσθαι, μεγιστον τι βοηθημα τουτο πυρετων συχνων εν ισχυρῳ δυναμει, και τῳ λογῳ και τη πειρῃ διδαγμενος, πρωτον μεν γαρ εις εναντιαν καταστασιν αφικνειται ταχιστα ψυχομενον εν τη λειποθυμια το σωμα, τουτου δ' ουτε τοις καμνουσιν, ουδ' αυτῃ τη διοικουσῃ τα ζωα φυσει δυναιτ' αν τις ἕυρειν ἥδιον η χρηστοτερον. επειτα δ' εξ αναγκης εν τοις τοιουτοις σωμασι ἕπεται διαχωρησις γαστρος, εστι δε ὅτε και χολης εμετος, εφ' ὅις αυτικα νοτιδες απο παντος του σωματος η ιδρωτες, ἅπερ ουν εκεινῳ πανθ' εξης γενο-

The person who was the subject of this experiment fell into a profound sleep; and, when he awoke, the disease was completely removed. The case proves the power of bleeding as a remedy for the cure of fever where the circumstances under which it is employed are proper, and where the management of it is conducted in a skilful manner. It here absolutely cut short the course of the disease by its own power; but it sometimes, perhaps oftentimes fails of that effect; it notwithstanding generally prepares a condition under which some other remedy, particularly the affusion of cold water on the surface is found to act with comparatively great force, and where it almost uniformly produces a decisive and fortunate change in the circumstances of the case. After subtraction of blood to the extent stated, a scanty sprinkling with cold water occasions a stronger impression, and is in fact followed by a more complete effect than the affusion of many gallons without the preparation alluded to.

The experiments which I have made myself, or which I have seen made by others on different occasions on the subject of bleeding, leave no room

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μενα, παραχρημα τον πυρετον εσβεσαν, ὥστε τινες των παροντων ειπειν, εσφαξας, ανθρωπε, τον πωρετον.

Galen, Opera. lib. iii. tom. 4. Edit. Basil.

to doubt of the stability of the foundations of the practice recommended in those conditions of fever to which I allude, viz. the concentrated endemic of the West Indies, or the more violent continued fevers of Europe. I am confident of my ground on this head; but I also am of opinion, and I believe the reader will be convinced by the authorities hereafter adduced, that bleeding may even be so employed as to arrest the course, or remove the dangers of other fevers besides the violent endemics of the inflammatory character. There is a communication from Dr Harness, commissioner for sick and wounded seamen, in the London Medical and Physical Journal for the year 1803, at page 581 of that work, stating the result of bleeding in the cure of a disease named yellow fever, which there is good reason to believe was infectious; it was at least highly malignant in its nature, and mortal in an extraordinary degree. Bleeding was employed as the remedy for cure: it arrested the progress, or removed the danger; and it also appears that the quantity of blood taken away was not measured by the preconceived opinion of the prescriber, but directed wholly by the effect, viz. the patient's feelings of relief. Lieutenant Douglas of the 85th regiment was the person who conducted this experiment. He assumed the office of physician from necessity, after the death of the surgeon and assistant surgeon of the ship in which he was passenger. The following are the words of the narrative: "*Lieutenant Douglas embarked on board of the Chichester store-ship at Jamaica for England, with one hundred and eighty men, seventy-four of whom died on the passage previous to reaching Hallifax in North America, exclusive of the captain, two lieutenants, surgeon, and surgeon's mate of the ship. Lieutenant D. then undertook the medical treatment of the sick; and it is stated that after the care of the sick had devolved upon him, sixty-two men (thirty-seven of whom were seamen) were attacked with symptoms of yellow fever, the whole of whom recovered by bleeding; three others were likewise bled, but, he observes, so late in the disease, or not until the symptoms of fever were so fully established, as not to be within reach of the remedy.*

"*Lieutenant D. remarks, the success in treating the disease was so evident to the troops and ship's company, that after a short time they would, on being taken ill, apply to be bled; and Lieutenant D. became so confident of its good effects, if had recourse to at the onset of the disease, as to induce him to give particular directions to be called at any hour of the night to perform the operation, should any one be seized with the leading symptoms of the disease: and in every case (the* *three alluded to excepted) he had the happiness to see every symptom give way or diminished, and all unfavourable appearances removed by one, two or three repeated bleedings performed at intervals of a few hours, as the necessity of the remaining symptoms indicated.*"

The other testimony, which I adduce, is from Sydenham, and it cannot fail to make impression, for every one subscribes to Sydenham's accuracy and candour. The disease was of a gangrenous character, and so highly malignant as to be regarded in the light of a plague. His narrative is to the following effect: "*When, together with the other calamities of civil war which most miserably afflicted this our native land, a plague spread wide, and, in its progress, appeared in the camp at Dunstable in Somersetshire as well as other places. Here some of the garrison died suddenly with the eruption of spots: the disease spread and attacked many. One of the surgeons, who had been a great traveller in foreign countries, and who then served in the army in common with others, earnestly solicited his commanding officer for permission to treat his fellow-soldiers who might happen to be attacked by this formidable disease, according to the view which might seem to him best. The permission which he solicited being granted, he proceeded to bleed every one of his sick, im-*

mediately at the very invasion of the disease and before any swelling was yet visible. In executing his purpose, he carried the evacuation to the extent of inducing faintness; so that the persons thus treated became unable to support themselves on their legs; for they were bled while they were on their feet and in the open air. No vessel was employed for measuring the quantity of blood to be taken away. It was allowed to flow upon the ground; and, as soon as the operation was performed, the patient was dismissed to repose in his tent or hut. No other means, besides the bleeding now mentioned, were employed; and, what is wonderful, of the very great number who were treated in this manner, not one died [*]." The practice which I now place before the reader will probably be considered by many as the practice of a farrier, not of a physician. I admit that the manner is rude; but those who know the laws of animal economy, and who estimate the principles according to which means act, will not, I believe, maintain that it is a practice without reason. The testimony of Colonel Windham proves that it was successful; and it may not be difficult for those who reflect on the nature of things to understand how it should become so. The blood subtracted was not measured by ounces in a prescription-book; it was allowed to flow till a certain effect which changed the existing condition became manifest; a mode of proceeding which, those who consider the case maturely, must admit to be drawing blood according to just measure. The operation was performed in the open air; and, as the evacuation was continued till fainting was induced, we may easily suppose that the impression of the pure atmosphere acted forcibly on this susceptible condition; and further, as the disease had not yet been of such continuance as permanently to derange the organic structure of parts, we might reasonably expect that the impression would originate a new form of movement analogous with that which obtains in health. There was here evidently exposure to the air; it is not improbable that there was also aspersion with cold water; for the blood was permitted to flow till languor or fainting occurred, and we know that, when this occurs, by whatever cause it may be induced, the vulgar instantly sprinkle the subject with cold water, or apply to him a strong stream of fresh and cool air.

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[*] Cum inter cæteras belli civilis calamitates quæ hanc patriam nostram miserrime afflixerunt, pestis etiam multis in locis grassaretur, ac forte in castrum Dunstar, quod in provincia Sommertonensi situm est, aliunde invecta, aliquot præsidiariis cum macularum efflorescentia derepente examinatis complures etiam alios corripuisset. Chirurgus quidam qui a longa in regionibus exteris peregrinatione redux tunc temporis stipendia inter alios faciebat, a præsidii præfecto enixe rogat ut sibi liceret commilitonibus suis truculento morbo correptis pro virili succurrere; quo annuente, singulis ægris, statim a primo morbi insultu, atque nullo adhuc tumore conspicuo, sanguinem ingenti copia detraxit, donec pedibus deficere inciperent, nam stantibus ac sub dio vena pertusa est, nec aderant vascula quæ cruoris in terram affluentis mensuram definirent. Hoc facto, eos in tuguriola sua ad decumbendum demisit. Et quanquam a phlebotomia nullum omnino remedium adhibuit, tamen complurimis iis quos hoc modo tractasset, mirum dictu, ne unus quidem desideratus est.—*Sydenhami Oper. p.* 83. *Lond.* 1705.

Emetics and purgatives.

It may be supposed to be proved, by the detail of experience and facts which I have now stated, that bleeding is capable of being rendered a powerful remedy, either for abruptly arresting the course of fever by its own power, or of moderating its violence and diminishing its dangers, particularly where its force is chiefly manifested in the circulating system; whether that be indicated by a rapid and precipitous, or by a sluggish and suspended course; and whether it be general throughout, or principally local as complicated with inflammation or disposition to gangrene in important parts. But while I hold this to be true, I must also observe that there occur many instances of fever where the action of the disease is not principally manifested in the circulating system, either by increase or defect of action; consequently where bleeding is not the remedy of principal dependence. The stomach and alimentary canal are manifestly affected in many cases in a greater proportion than the other parts of the body; and, as it is a general rule in the healing art that the remedy should be applied as near as possible to the part principally affected, it follows of course, that emetics and purgatives are now the first means which present themselves to the notice of the physician. The fevers which arise in crowded barracks, in crowded transport-ships and crowded hospitals, often shew marks of a primary and principal affection of the stomach ; and in such case, emetics of severe operation, particularly when followed by strong purgatives, or more especially when followed by repeated doses of James's powder with calomel, so managed as to act on the bowels and also to open the skin, frequently cut off the disease abruptly, or entirely removed its dangers, preparing at the same time that state of susceptibility of system which lays the case open for the affusion, or rather for the aspersion of cold water on the surface.

But, as there exist many cases of fever where bleeding is neither useful nor safe ; so there are others where neither emetics nor purgatives are proper, if they even can be at all admitted ; hence other means must be resorted to for accomplishing the cure of the disease, or for effecting such a change of its character as may dispose it to be readily cured. The action of fever, for instance, is sometimes strongly manifested in the surface of the body; and this is sometimes characterized by a lively and glowing heat without vascular commotion of unusual force; sometimes it is accompanied by coldness, clammy dampness, or by a dry, withered, a shrivelled and torpid condition of the skin with feeble vascular action. In the first case, the affusion of cold water on the surface is a grateful and a sovereign remedy;—it often in short arrests the course of the disease by its own power: in the other, the effect of the cold affusion is very uncertain; it may not even always be safe, and, unless a given condition be prepared previously to the application of it, there is no confidence to be placed in it. The condition of preparation alluded to is attained by moving the subject through the pure air in an open cart or carriage, by the application of the warm and pure air to the surface and lungs, by immersion in a warm bath, or by the affusion of warm water and other processes which imply a complete purification of the skin. This is effected by scrubbing the body strongly with brushes after it has been rubbed with soap and affused with water. By this means, the susceptibility of the system is highly increased; and, when this is attained, the subject is prepared for the easy and certain action of other means.

Warm bathing and frictions.

The conditions of disease which I have noticed above are evidently different from each other;

and, if the conditions differ in the manner stated, we infer that the means employed with the view of effecting a decisive cure, or of preparing the subject for the application of what is held to be decisive, cannot reasonably be supposed to be one, and at the same time be expected to be successful. Hence we conclude, and the fact is visible, that the object sought for is attained at one time by means of bleeding; the effect of which reaching to every fibre of the frame arrests the progress of the diseased movement, subverts the existing action, and thus creates a condition prepared to move into the right channel by the application of causes which are always present, but which are not always powerful enough to control the disease while proceeding in a determined course; at another time, and under different circumstances, a similar favourable condition is attained by re-adjusting the balances of action through the whole extent of the system where these happen to be unequally disposed in different organs; a purpose effected sometimes by local evacuations, sometimes by means of powers which solicit the circulation of blood to the surface, and which augment the sensibility of the skin. The subject is thus rendered easily susceptible of a healthy form of action as moved by the stimulation of external applications; greatly more so than he would be if such process were not instituted. This brings us to a consideration of the affusion of cold water upon the surface as a remedy for the cure of fever: the circumstances to be observed in conducting which I shall now detail with as much care and precision as I can; for it is the professed object of the work, and it is important that it be well understood.

Manner of affusing cold water.

The affusion of cold water, as a remedy for the cure of fever, is in a great measure new in this country; at least it has not as yet moved into the higher spheres of society, or obtained such sanction from the more celebrated physicians of the age as might be expected to give it currency through the kingdom. I have mentioned the manner in which the idea of its probable utility was first suggested to me, and I have detailed some instances of its success, which will, I believe, be deemed satisfactory to most. The first experiments which I made with this remedy were made with salt water; and, as the effect exceeded my expectations, a surmise suggested itself, and I believed in it for some time, that great part of the extraordinary benefit which occurred in the cases alluded to was derived from the stimulating action of salt upon the skin. Later experience has undeceived me on this head; for, though I still believe that salt water acts more powerfully than fresh water of the same temperature; yet it is perfectly well ascertained in trial that the one may be employed with safety, where the other cannot be easily procured. The effect of cold water, where just capacity of action exists in the subject of the experiment, bears proportion with the impression on sensation. Impression has a visible correspondence with the temperature of the medium; consequently, the greater the degree of cold the more sensible is the impression, and the more marked the form of action which subsequently ensues. In order therefore that the power of the water be so augmented as to command the expected effect, it is fit that its temperature be reduced to a low degree,—to 40° of Fahrenheit's thermometer, or even lower. It is evident that this condensed power of remedy is principally necessary where the disease is violent; but it happens unfortunately that it cannot be easily obtained in a condensed state in tropical climates, where fevers are so often of a violent and precipitous course. The violence of the disease must therefore be then reduced by other accessories, so that the resistance come within the reach of water cooled by exposure to the night air, or by the solution of salt. In temperate and cold climates, though it be not necessary to cool the water artificially, it is always proper to take it fresh from the spring, the pump, or open sea. The water is thus pure; the affusion of it is supposed to be adjusted in force and quantity according to circumstances, and repeated at intervals discretionally till such time as a just impression is visibly made upon the habit, the indication of which is often manifested in the action of the circulating system. If the purpose desired be not attained completely by the first affusion, the cautious physician will do well to re-examine the case in order to ascertain the circumstances which appear to have marred the just effect; and, having done so, viz. having ascertained the cause of impediment and removed it as perfectly as he can, he will then repeat the operation with such additional assistances as his new information may have suggested to him. The affusion may be made boldly and fearlessly in the commencement of the greater number of fevers: it must be made cautiously and with a careful consideration of circumstances in the latter periods of most. It was my custom at one time, particularly in the West Indies, to dash the water on the head and about the shoulders with force and in quantity by means of buckets. I now ordinarily, particularly in Britain, pour it on the head and shoulders through a large sponge; I pour it however in such quantity as to imitate the streams of a shower-bath. The impression is strongly felt: it is sufficiently powerful in most cases to arrest the course of the disease, and to originate a new and healthy form of action; especially where the temperature of the water stands at 40° of Fahrenheit's thermometer, or lower. In tropical climates, where the disease is violent, the course rapid and precipitous, and where the temperature of the water is not perhaps lower than 76 or 77°, the effect of affusion by means of the sponge will rarely be found to be sufficiently impressive. The difference in temperature must therefore be made up by the quantity, the force and impulse with which the water is applied: hence water, descending from a height by pailfuls, is more suitable in the case alluded to than the gentler affusion by means of the sponge. But while water dashed forcibly, or falling from a height in quantity, is decisively impressive and ordinarily safe when employed in the early stages of fever; so affusion, ablution, or aspersion by means of the sponge, as being more safe, is more eligible in its latter periods; for while safe, it is sufficiently impressive if there exist greater mobility than usual; and great mobility is by no means rare after a protracted continuance of disease, which implies, among the circumstances of its history, exhaustion or inanition. The application of cold water is here supposed to be made to the surface generally; but it is also understood that the first and most forcible impression of it is directed upon the head and shoulders, for the force of the disease is ordinarily manifested in the highest degree in the superior parts of the body. It was also my custom, and it is evidently an useful one as serving to promote the effect desired, to immerse the lower extremities in warm water at the time the cold water is poured upon the superior parts in the manner stated. But that this subject be placed in as clear a light as possible, I shall detail the steps of the process as it was usually conducted by me, both in the West Indies and in England. The subject for example is placed in a bathing-tub which is half filled with warm water: he is here thoroughly washed and cleaned, rubbed all over with soap, and even scrubbed with a brush, so that every impurity is not only removed from the skin, but the skin itself is rendered unusually susceptible by the action of the means stated: he then, either sitting in the tub or standing upright as best suits with his condition, receives the cold water on the head and shoulders as it falls with a shock from the bucket, or as it descends more gently and in smaller quantity through the sponge. The form of disease to which this discipline is applied is understood to be fever affecting the system generally—without material local affection, or organic derangement; for, where local affection, or organic derangement forms a prominent feature, the mode of proceeding requires a peculiar modification of management. For instance, where the cause of the disease acts by producing intellectual derangement, the proper and more effectual manner of applying the cold water is by affusion on the bare scalp, the stream descending from a considerable height,—varied in manner, sometimes very slender, or almost by drops; sometimes copious, even dashed with force. In fevers of the dysenteric form, where pain and irritation in the alimentary canal are urgent, the local application of sponges wet with cold water, or the injection of cold water into the intestines by way of glyster brings signal relief:—the practice I know is not usual; but my own experience proves sufficiently that it is both safe and salutary.

When the operations now described are completed, the subject is disposed in bed; either to repose in quiet, or to be subjected to such other discipline as may be thought yet necessary to ensure his recovery. And here we may observe that, there is not ordinarily much occasion for being scrupulously nice in drying the skin where there is an excess of superficial heat, particularly in recent disease: on the contrary, where the patient is weak and languid, more especially in the advanced periods of continued fever, the skin is not only to be carefully dried; but, even after it has been dried with linen towels, it is highly grateful—and not indifferent in effect, to rub it with hot flannels, and sometimes perhaps with warm oils. Such is the rule of management to be observed on this subject. It must be varied according to the circumstances of the case. The method may seem complex, but it receives authority and illustration by reference to the manner in which the ancients, and particularly Galen the most systematic of the ancients, conducted warm and cold bathing when employed with a view to arrest the course of fever in its earlier stages. The example to which I refer is that of a person aged thirty-five, who was seized with fever, apparently in consequence of having bathed or washed himself in the styptic waters called *Albula.* The bathing is thus managed: "*It is fit and proper, as soon as the first paroxysm begins to decline, to conduct the patient to the bath, to direct that he be affused lavishly with warm water, if agreeable to his feelings,—not once merely, but repeatedly—and after an interval. This is the general view; but omitting all other examples of experiment, I shall content myself with mentioning that of a person, who, having bathed in the styptic waters known* *by the name of Albula, was seized with fever in consequence of the constriction of the skin thereby induced. This will serve to give an illustration of the principle on which I act; and the fact itself must be held to be authentic, in as much as it was witnessed by professional men of eminence, one an Erasistratean, the other of the Methodic School. It seemed adviseable, according to the view of the physicians now alluded to, that abstinence should be enjoined the subject of this narrative; I, on the contrary, not acquiescing in the opinion, (for I arrived after these persons had taken their leave), conducted the patient to the bath without loss of time; where, affusing him lavishly with warm oil, and rubbing him very gently, I ordered him to remain a considerable time immersed in warm water; then, removing him from the warm water, and submitting him in the customary manner to the application of cold water, I covered him with a sheet and directed him to recline for such time as he should recover from agitation; after which, reconducting him to the bath, anointing him with oil, rubbing him and commanding him to remain for a length of time in the warm water, removing him, plunging him into the cold reservoir; and then wiping him dry, I administered nourishment, viz. immediately after the operations were finished, a draught of water followed by a portion of barley* *gruel, and, at a short interval, some lettice*.*" It deserves mention in this place that Galen does not conduct his patient to the bath till the violence of the paroxysm has begun to subside; and further, that he exposes him in the heated air of the bathing room, affusing oils and employing frictions previously to immersion in the warm water,—when removed from this he is plunged into the cold reservoir. The process of management is a luxurious one; and we have reason to expect, from the alternations which it embraces, that the effect cannot fail to be a considerable one on the existing actions of the system.

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* Δεον αυτικα του πρωτου παροξυσμου παρακμαζοντος, απαγειν εις το βαλανειον. επιτρεπειν τε λουεσθαι πολλακις ει βουλοιντο, μη μονον ἅπαξ, αλλα και δις. εγω γουν εασας απαντας τους αλλους, αναμνησω σε του λουσαμενου μεν εν τοις στυπτηριωδεσιν ὕδασιν, ἅ καλουσιν Αλβουλα, πυκνωθεντος δὲκ τουτου το δερμα κἀντευθεν αρξαμενου πυρεττειν, αρκεσει γαρ ενεκα σαφηνειας ὅυτος ὅιον παραδειγμα τι του λογου γενεσθαι, παρησαν μεν επισκοπουμενοι των ουκ αφανων τινες ιατρων, ὃ μεν Ερασιστρατειος, ὃ δε μεθοδικος. εδοξε δ᾽ἀμφοτεροις ασιτησαι τον ανθρωπον, ουκ μεν ειασαμεν γε ἥμεις, χωρισθεντων αυτων, ελθοντες; αλλ᾽ εις βαλανειον εισαγαγοντες ευθεως, και χλιαρον ελαιον επιπλειστον αυτω περιχεαντες, ανατριψαντες τε πραοτατα, το πλειστον του χρονου μερος εν τω της θερμης δεξαμενης ὕδατι διατριβειν εκελευσαμεν. ειτα εξελθοντα και χρησαμενον ὕδατι ψυχρω κατα ειωθοτα, σκεπαντες σινδονι, και βραχυ καθισαι κελευσαντες ὥς ανακτησασθαι την δυναμιν, αυθις εισαγοντες εις το βαλανειον, ομοιως τε παλιν αλειψαντες τε και τριψαντες, και κατα το θερμον ὕδωρ χρονισαι κελευσαντες, ειθ᾽ αυθις εξαγαγοντες και τω ψυχρω βαψαντες, απομαξαντες τε τροφην εδωκαμεν, αυτικα μεν εξελθοντι μετα το πιειν ὕδατος, πτισανης χυλον, και ολιγον διαλειποντες, θριδακινην.

Galen. Oper. tom. iv. lib. 8. p. 119. edit. Basil.

Period most proper for affusion.

I have now mentioned generally, the manner of applying cold water to the surface of the febrile subject; I shall next make one or two observations on the most proper times, or most favourable periods of the disease at which it may be applied. It is admitted by all persons, who have turned their attention to the management of this remedy, that there are conditions more or less favourable for the cold affusion, according to the stage or point of progress at which the disease is presented, independently of the circumstances belonging to the peculiar character of the disease itself. It is thus remarked that the favourable conditions for the decisive effects of cold affusion present themselves more commonly in the early stage of the febrile course than at the latter periods. The fact is generally true, and it admits of an easy explanation; viz. that the disease has not as yet permanently deranged organic structure by its effects, or proceeded far in its course towards a critical termination. It may thus be then arrested with a great degree of certainty, and ordinarily with perfect safety. In the more advanced progress it is controlled with difficulty,—and frequently not without danger; for the diseased movements which exist are forward in the act of producing an effect which is not yet completed. Such movement cannot be easily arrested; or if arrested forcibly, in its direct course, it may be perverted into a dangerous channel. On the contrary, if the diseased course hath arrived nearly at a critical period, that is, where the effect is prepared, but not yet visible in issue, the affusion of cold water often accelerates it, and even renders it more complete than it perhaps would be otherwise. This is not peculiar to the affusion of cold water only. We find that other remedies besides this, according to their own nature and the condition of the subject to which they are applied, cut off fever in its early beginnings, or render its termination more perfect at the natural period of crisis: —they are applied with less, perhaps with no impression in the intermediate periods. It is thus reasonable to suppose *à priori* when we consider the nature of things, and it is found to be true in fact when we judge the case by experience, that the cold affusion is most decisive in its effects in the early stages of fever; that is, before the disease has assumed that particular figure of action which produces a defined critical act, or before it has laid the foundations of permanent organic derangement. In both these conditions the general susceptibility is diminished,—absorbed if I may be allowed to use the term by the action which leads to crisis, or involved in the process which accomplishes the destruction of a part, and which often implies in its consequences the entire destruction of life. As it is admitted that the application of cold water to the surface arrests the fever completely and safely when applied at an early period of its course; so we conclude that the condition for its effective action is then favourable. The disease has not yet assumed a steady form; and the powers of life, as not exhausted by its continuance, are often comparatively strong. Where the powers of life are strong generally, and where internal organs are not injured locally, the means may be employed with freedom, even with boldness so as to establish its own impression. This explains the marked success of the effect of the remedy when employed at the early stage: on the contrary, the chances of success generally diminish as the disease advances and becomes confirmed in its course; and it sometimes happens that these chances are then so small that we cannot venture to employ the cold affusion with much expectation of benefit. A protracted course frequently generates a complication in the form. In that case, the remedy, as is easily understood, is little effectual without such preparation as previously simplifies the complication; and further, the protraction of the course, while it frequently complicates the form, ordinarily brings in its train a condition of exhaustion and diminished power of re-action, in which the strong impulse made by the full affusion is not perfectly safe. This is the fact; and hence this practice, without the most exact attention in preparing the condition of the subject, and the utmost caution in applying the means of remedy, is sometimes dangerous—not unfrequently ineffectual. But, while the chances of success diminish, or become precarious as the disease advances in its course; whether by complications which arise as a consequence of diseased action, or by evacuations,—natural or artificial, and other causes which exhaust the vital power and thus render the full affusion of cold water hazardous, we must also bear in mind that when circumstances, which mark the favourable solution of the paroxysm of the periodical fever, or the decided crisis of the continued, clearly manifest themselves, the application of cold water to the surface in the manner stated is superfluous, if not dangerous: on the contrary, it appears often to accelerate the crisis, and to render it more perfect when applied at the precise point when the critical matter is in a manner prepared, but seems as if it were restrained within—by some unusual constriction.

As it is generally understood that the favourable condition for the application of cold water to the surface presents itself more frequently at the early stages of fever than at later periods, we may thus suppose that the opportunities of applying it present themselves more commonly to the military physician, the army and navy surgeon, than to others. In civil life, the physician, and even sometimes the apothecary, is not introduced to the febrile patient till the disease is considerably advanced, probably till symptoms of danger have arisen, and till the circumstances favourable for the employment of the cold affusion, if they ever existed, have actually disappeared. In the army and navy, the medical officer has it in his power to visit the sick of his corps or division at all hours and seasons. It is his duty to visit them as soon as they are known to be indisposed; and, as it is his duty to perform this visit, he will find it to be his interest, as ultimately shortening his toil, to execute it with some attention. If he examine the condition correctly, he may ascertain precisely whether or not he is warranted in making early trial of the cold affusion; for, if he ascertain the condition to be the fit one, the cold water, when judiciously and effectively applied, rarely fails of cutting short the course of the disease abruptly, and thus relieves him from all anxiety and concern on the score of his patient: on the other hand, it in fact often fails where the circumstances are misapprehended, or where the quantity of the means is miscalculated. Hence diligence and decision are necessary, or rather indispensable for the success of the practice; but it too often happens that they do not appear where they ought to be found; and it thus happens that, though the favourable opportunity of acting be placed within the reach of the medical officers of the army and navy, it is often suffered to pass away without being turned to account.

General ground of cure.

Negligence may thus be the cause through which the proper opportunity for acting is suffered to pass over on many occasions; but I must further observe that, where no charge of negligence can be brought against the medical officer, instances of fever often occur, which, at no period of the course, present that form of condition which gives warrant of success to the measure recommended—without a careful previous preparation of the subject of the experiment. This is the fact; and, with the knowledge of this fact well ascertained, I hold it to be necessary to devote a part of this work to the examination of the characters of the various forms of fever as they actually exist and occasionally present themselves; so that I may thereby ascertain the conditions of fitness or unfitness for the affusion of cold water as a remedy employed for the cure of the disease. Where the fit condition is ascertained to be present, the application of the remedy is to be made without loss of time; where the condition is wanting, the first object in the physician's view, and the first step in his proceedings is directed to discover the kind, and to adjudge the quantity of the means which prepare it artificially, in such manner that the remedy may be applied with safety and effect. The base of the preparation consists, as has been already observed, in restoring susceptibility of impression generally; it consequently comprehends the removal of all forms of irregular action, all internal inflammations, or organic congestions; and it moreover supposes the existence of an animated susceptibility of the surface of the body throughout. When this is attained in due degree, the remedy is rendered capable, when applied generally, of communicating impression to every fibre of the frame with just force: hence a renewed form of action through the whole extent of the system, analogous with the character of the power applied, follows as a consequence of impression, where the capacity of the subject is not impaired organically. This state of balance, viz. susceptibility of impression and capacity of action, usually termed action and power of re-action, constitutes the general base on which remedies produce their effect. But, as the human body is a complicated machine, consisting of many organs, different in office and function; and, as it is differently affected on many occasions by the action of causes fundamentally the same, but different in their forms of combination, or differently received according to variety in the relative conditions of the subject to which they are applied, it is plain that the means of reducing it to this susceptible condition must necessarily vary in form and degree of force, in correspondence with the implied variety of circumstances. The adjustment of the balance of action and re-action, which is held to be the base on which remedies act, is effected at one time by the operation of such means as diminish the quantity of the circulating fluids, either directly from the vessels which circulate red blood, or through some one of the emunctories which secrete and discharge superfluities; it is effected at another time, by the operation of means which solicit an equal distribution of blood and vital energy in the extreme parts; and which thus equalize the circulation of the mass, but which do not directly and evidently diminish its quantity. I shall endeavour to describe these different conditions with as much precision as I can, aware at the same time that I shall be held to be tedious and irksome by many; instructive and correct—perhaps only by a few.

Cure in detail—infectious fever.

In proceeding to consider this part of the subject, I shall first notice the mode of management to be adopted in that form of fever which arises from a source of personal infection, and which is now usually distinguished by the name of *typhus.* It is perhaps the form of fever to which cold water may be applied with greater expectations of success than any other—without previous preparation of condition by means of art. It seems to arise from sources differently concentrated, or differently modified; and, though I may not be correct, I shall state what occurs to me on this head. 1. There exists a febrile indisposition, which seems to draw its origin from a cause which is generated in crowded and ill-ventilated apartments—among persons who are not generally confined to the sick-bed. This happens frequently in jails, in ill-constructed and crowded barracks. The disease, so produced, is usually of short duration, its period rarely exceeding five days. It then subsides; but it often recurs again at a short interval. It is the least fixed of any of the forms of the infectious fever; and it yields more certainly than any of the others to the affusion of cold water on the surface, particularly when the affusion is preceded by an emetic. 2. A form of infectious fever, the cause of which is apparently referred to emanations from diseased subjects, also presents itself frequently to observation. This form arises chiefly among those who attend upon sick in hospitals, or elsewhere. Its

Sources from which fever seems to draw its origin.

period is longer than that of the preceding; for it rarely reaches its termination before the seventh day. It then sometimes only changes form, and it frequently passes through another septenary revolution, even sometimes two other septenary revolutions, before it terminates finally. The affusion of cold water on the surface is here ordinarily a powerful remedy in itself: but it is less sovereign than in the preceding; for, as the diseased action is strong, the mode determined and steady, the remedy does not always make impression sufficiently forcible to arrest the course abruptly and effectively—without the aid of such previous preparation as moderates the violence of the morbid action, or, as simplifies complication where that exists. 3. Infectious fever likewise presents itself, as arising apparently from a cause lodged upon clothing and such other dead matters as have been in contact with the bodies of sick persons. The cause may here be suppossd to be condensed, or otherwise modified by the medium through which it is conveyed; for the effect produced actually appears with a different aspect from that of the two preceding. The movement of the morbid action is often slow and obscure; but though obscure, it is not easily acted upon, so as to be dissevered by the impression of feeble powers. The course is tedious: changes generally occur at septenary periods, but the sum of the total duration frequently extends to several weeks; and in fact, the disease often assumes one or other of the forms in which the affusion of cold water on the surface does not produce abrupt and decisive effect, unless the circumstances have been changed previously by the preparation of the fit condition.—The conditions, which I have thus described, occur to me as connected with the particular form and concentration of cause; but I am ready to confess, at the same time, that their real boundaries may not be found to be so precise in all cases as I have stated them to be. It is however true, and it must have been often observed by others as well as myself, that the duration of the disease is short where the source is chiefly impure air, especially as produced by the undue accumulation of persons in ill-ventilated apartments, that is, by emanations proceeding from persons, who, though they may not be in perfect health, do not yet give evidence of the existence of actual fever. The effect of the cold affusion, as mentioned before, is here effectual,—more effectual than in the others:—preparation of subject is moreover rarely required to precede its application. The duration is long, where febrile emanation from the living body is the cause solely, or in conjunction with impure air. It is perhaps still longer, where the disease arises from the contact of impure matter alone. This is supposed to be the case with those who touch infected clothing, or who come within the sphere of condensed fomes; for persons so exposed are ordinarily observed to experience a tedious disease, and one that is comparatively little tractable to the effect of usual remedies.

First—or open form of infectious fever.

The action of infectious fever, from whichever of the sources now described it may arise, and whatever form it may assume, is evidently manifested in the surface of the body. The figure of the action is peculiar, but various in its modes. The character is usually discernible by the accurate observer as differing from that of the endemic; the difference however is not easily defined in words. In one form of the disease, horror and shivering, as is usual in most fevers, alternate with flushings of heat. The horror rarely rises higher than a slight creeping sensation of cold: trembling and shaking occur but seldom; and those anxieties and inexplicable distresses, which sometimes present themselves in the early stages of the endemic, are here rarely conspicuous. The flushing heat, which is often felt partially from the first moments of the attack, soon becomes general; it diffuses itself in the surface, even in the extremities, and thus predominates throughout. The skin is hot and glowing, particularly on the face, forehead and trunk of the body. But though the skin be hot and glowing—with an impression of rapid motion in the matter of heat, the quantity of it is not great in degree, as judged by the touch of the hand of a person in health, or as actually measured by means of a thermometer. It is not uniform in tenor, ardent and concentrated in force,—it usually explodes in successive streams: the face glows, and flushes as after drinking wine, or as happens in entering suddenly into a heated apartment from a cold external air. The eyes are red and muddy: the appearance is, however, different from that of common ophthalmia though I cannot pretend to explain precisely in words in what the difference lies: they are often hot and painful, sometimes they sparkle and glisten like the eye of the lascivious. The pains of the head are usually acute; they lancinate by sudden starts: pains dart irregularly through the limbs and strike off in every direction by explosions. The tongue in this form of disease is frequently foul, white, moist and slimy; but not always so. The thirst is irregular, sometimes great, sometimes not much greater than natural. The pulse varies; sometimes it is frequent and quick; it is rarely hard and tense; sometimes it is full, open and free; it is rarely agitated, not often irregular, and seldom oppressed, as if struggling to overcome resistance. Internal inflammations, or deep-seated organic congestions occur but seldom; for the action of the disease, as it manifests a lighter form of movement throughout, is visibly and openly expressed in the surface of the body. The form of disease here described constitutes the open and active form of infectious fever; but, as the action does not run into excess, or assume a character of complication, the case presents a condition favourable for the affusion of cold water without previous preparation, or, at most with such preparation as is secondarily and easily attained. The tongue is often foul and slimy, testifying that the cause of the disease acts with an over-proportion of its force on the stomach or first passages. In such case, an emetic precedes the cold affusion with advantage; and affusion is then usually observed to arrest the febrile course instantly, and to favour the return of health permanently. When the diseased course is forcibly arrested, a new form of action takes place, either as a consequence of the general cause of stimulation which is universally diffused in the atmosphere, or of a particular and more forcible one adapted to a particular case. In the earlier stage, where the habit has been rendered easily susceptible of impression, and where the vital energy is preserved entire, or but little impaired, the means now described often effect a complete and final cure:—the period, at which this purpose may be expected to be attained with confidence, is comprehended within the third day.

Second or obscured form.

Besides the form of infectious fever which I have now described, in which the application of the cold water to the surface of the naked body is a powerful and often a decisive remedy, even when made without artificial preparation of condition, there frequently occurs another in which the favourable condition is wanting, or, where it is but imperfectly present. Certain occurrences give it accidentally, or certain processes of management are employed to give it artificially. In the form mentioned above, the febrile action is animated and lively; here it is languid and feeble—suppressed, or in some manner marred in expression by the accidental concurrence of foreign circumstances. The febrile action is now irregularly balanced in the different parts of the body, and it is often obscure in the whole. Headach, which is rarely absent in some shape or other where fever exists, and which was said to be acute, darting suddenly in explosions in the case last noticed, is here such as the patient terms muzziness and confusion, rather than acute pain. The eye is often languid, vacant, and inanimate;

sometimes it is downcast and melancholy as if supplicating relief. The skin is often damp and dirty, as if it had been washed with greasy water and imperfectly dried; sometimes it is parched, shrivelled and withered like a fading leaf. The superficial heat is rarely high,—sometimes not above natural, now and then below it. The pulse is usually small or without expansion,—ordinarily feeble and irregular in time; sometimes frequent, sometimes not more frequent than natural. The balance of secretion and excretion is also changed or perverted,—excessive in one part, defective in another. Thus, if the skin be dry and withered, or damp, greasy and cool, the functions of the abdominal system are often irregularly performed: if the bowels be open, the evacuations are watery,—the stools rarely effective of relief. The condition now described constitutes one of the forms of infectious fever, and it is not a rare one, particularly among soldiers who are thrown together in transport-ships, or who are crowded in barracks on shore in cold, close, damp and foggy weather. It is also presumed that it is frequently seen in the crowded, cold, damp and dirty cellars of the poorer class of manufacturers in large towns. But among whatever class of subjects it may actually shew itself, whether among soldiers or manufacturers, it is necessary to recollect that it presents itself, as now described, in a form not well prepared to assume movements analogous with those of health by the application of cold water to the surface; hence the employment of such means of previous preparation as are capable of creating that condition which consists with the favourable action of this remedy, becomes necessary, even indispensable to success. The fit condition is connected with the existence of general susceptibility; the means of preparing which, where it is wanting, consist generally in the application of powers which gently and gradually solicit the circulation and tide of life to the surface and extremities of the body. Among these means, whether employed by design or necessity, may be reckoned the act of transporting the sick to a distant hospital in an open conveyance, exposed to the ventilation of the pure air, even submitted to all the chances of weather, viz. wind, rain, heat and cold. It is in this manner that the preparation now required is made effectively, though undesignedly and from necessity in the contingencies to which military service is exposed. The act of transport implies a change of circumstances which materially affects the condition of the subject; and it is thus noticed frequently by those, who do not look farther than to notice a fact, that the disease assumes a new form of expression in consequence of such change, whether the transport be made by waggons at land, or by boats at sea in stormy weather. A change now occurs, and it is often in fact such as prepares the way for the favourable action of the cold affusion. But these means of preparation, though often sufficient, are only applied accidentally; and, as there is no estimate or calculation in the case, the effect must necessarily be precarious and uncertain. As preparation is a matter of importance, it ought not to be left to chance where it can be assured by art. To assure it by art is, I believe, attainable; and the way through which it is attained is not an intricate one. It consists in moving the subject into a warm, dry and well ventilated apartment, in cleansing his skin most perfectly from all impurities by means of soap and water, frictions or scrubbing with brushes, in immersing him in a warm bath; and finally, in rubbing him with coarse towels, with warm flannels, continuing the frictions and raising the temperature of the apartment proportionally high till the tide of circulation and the expression of life manifest themselves in force at the surface of the body; that is, till the susceptibility of impression be restored and the capacity of action exalted to a high point. Besides the scrubbing with soap and brushes now noticed, which I first adopted with the view of removing incrusted dirt from the skin of the slovenly soldier, but which I subsequently found to increase susceptibility in an eminent degree, and which has become an instrument of preparation on its own ground, the Russian mode of bathing conduces highly to the purpose in question. This practice proves the safety of alternations of temperature; and it, at the same time, furnishes example of the great power of such alternations in moving new actions in the system. Where the susceptibility of impression and power of re-acting now sought for are present in the just degree; whether a natural circumstance in the mode of action which the disease assumes as in the form first described, or prepared artificially as in this last, the condition required exists, and if the condition exist, the effect of the remedy is equally sure in one case as in the other.

Third—comprehending complicated forms.

Cold water may be affused upon the surface, either without preparation, or with a comparatively easy and obvious one in the two forms of fever now described; there still exists another, in which this remedy cannot be expected to be decisively useful without such careful preparation of the subject as creates the fit condition; and this, it must be confessed, is not always a business of easy accomplishment; for it requires labour to examine the case with accuracy, and it requires discernment to judge its real character with precision. The case is often complicated: the execution of the preparation is therefore difficult; and, if not carefully conducted, it is not exempt from danger. Fever of the gangrenous character, whether it manifest a highly irritated and irregular action at the commencement as sometimes happens, or a general torpor and local stagnation as is by no means rare, is included under this head. The case appears to be different as viewed externally; but similar preparations modified according to circumstances, and a similar remedy applied to the subject thus prepared, attains the end in both; and, on this account, I bring them together under one view in adjusting the means of cure. The leading features of this complicated form, directly or contingently gangrenous, are thus contrasted. The pain of the head, which is a common symptom in all forms of fever, is oppressive and dull as if the patient were stunned by a blow in one case; it is severe and rending as if the brain laboured for expansion in the other. The customary sensation of things is changed in both. In one, the animal and organic action is in some manner suspended, though not uniformly in all parts; it is irritated and exerted irregularly in others, but in different degrees. The pulse is thus sluggish in the one,—

obscure, without energy; and it is seldom much increased in frequency: it is for the most part frequent in the other, tumultuous and irritated, expressing the existence of some unusual impediment or resistance to the course of the blood. The respiration is deep,—with frequent sighing: together with this there is difficulty of expanding the chest, connected with a sense of stricture and oppression generally diffused — but without local pain: sometimes the respiration is hurried and agitated, without distinct sense of pain, but accompanied with such tumult and agitation as shew that the lungs are materially affected. The countenance in one case is heavy and inanimate, dark, clouded, or leaden coloured, torpid, or with a melancholy expression: it is grim, agitated and embarrassed in the other, as if things were confounded and mixed together unnaturally. In one, the eye is vacant and unmeaning; sometimes it is unusually white and glossy, sometimes of a dusky yellow,—the veins turgid: in the other, the appearances have more resemblance with appearances of active inflammation,—the motions are agitated and wild. The skin is sometimes dry, thick and impervious, bloated, dingy and dark like the colour of mahogany; sometimes it is yellow and withered; sometimes damp, clammy and greasy, as if dirty in spite of washing. The heat often appears moderate when the skin is touched lightly; it seems even to be lower in some instances than it is in health; in others it is intense, concentrated and ardent like that of a burning coal,—its distribution is generally unequal. This is more particularly the case in the irritated forms which terminate after some continuance of struggle in general stagnation or local gangrene. The tongue is white and slimy, often leaden coloured; it is rarely dry. A peculiar torpor of sensation together with a suspension of active function, or irritations of unusual violence, but irregular and ineffective of purpose, characterize this form of disease; and thus, instead of fainting, or a disposition to faint as connected with excess of mobility, there is sluggishness, or defect of energy joined with a sense of weight and oppression. Purgatives, even of the most active kind are now slow and uncertain in their operation; blisters, applied to the skin, do not rise at all, or they rise only imperfectly,—the cuticle in fact, instead of being raised into vesicles, seems as if it were seared by a hot iron in consequence of their action. The functions of secretion and absorption are diminished, or in a manner suspended. The efficiency of these offices depends upon the character and activity of the movements which obtain in the circulating system; and it may be comprehended, in some degree, how this matter stands by observing what happens in drawing blood from the arm by a lancet. The blood is here usually of a dark colour, and it flows slowly or interruptedly, though the orifice made in the vein be a large one; a fact, which may be supposed to furnish proof that the circulation is slow—approaching to stagnation, or that a cause of constriction interrupts its course. If it flow rapidly, as in the case of irritation, it flows with agitation and irregularity. It is evident from these circumstances which I have stated that the gangrenous disposition is present, either directly, or in preparation to arise contingently as a consequence of the existing action. The gangrenous act consists in suspended or impeded motion, the termination of which is absolute stagnation or death. But though stagnation be the final result, the effect follows after a different manner in different cases. It follows in one by a slow and regular process,—a silent suspension of function; in another, by a violent tumult and agitation, which terminates locally in a complete gangrenous effect, or in failure of power throughout the system generally. In neither of these cases does the febrile cause develope itself into open and regular action:—the subject dies prematurely, frequently within the fifth day, sometimes within the third.

The form of disease, now described, is one of the most extreme danger. It presents itself on some occasions as the product of infection in the highest state of concentration; for it is connected evidently with the obvious cause of accumulating sick persons in confined space. As its dangers are extreme, so common medical treatment does but little in effecting the arrest of its progress; even the affusion of cold water on the surface, with all its power, is not here sovereign, perhaps not generally useful without a previous preparation of the subject. A certain condition of susceptibility, as has been often impressed upon the notice of the reader, is necessary to insure the successful action of this or any other remedy; and it is plain to any person who reflects on what he sees that susceptibility does not exist in the case stated—in fact it is not present, whatever may be the form of action through which it has been suffocated or suppressed. If it do not exist naturally, it is evident that it must be given artificially; and it is a clear point that, in a case so complicated and perplexed as that now described, boldness and decision of no ordinary measure are required to give it with safety and effect. It is assumed as a fact, and the existence of it will not be disputed, that the proper preparation of the febrile subject for the application of cold water to the surface consists in simplifying complication, and in restoring, even in exalting to a higher pitch than natural the constitutional susceptibility of impression. By this means the remedy is rendered equal, even paramount to its object; and, if it be applied in this condition with discretion and discernment, the effect is comparatively sure. This effect is gained, in some part, by soliciting the tide of blood to the outer circle of the body—the surface and extremities; for the circulation is thereby more equally balanced; and that is accomplished, in some degree, by applying warm fomentations to the feet and legs, or by immersing the lower parts and even the whole body in the warm bath, but principally by subtracting blood from a vein, the quantity of which is to be measured according to the circumstances of the case. The bleeding is generally to be performed while the extremities or greater part of the body are immersed in warm water, the skin having been previously scrubbed with soap and brushes, and the parts, not immersed, having been freely sprinkled with warm and cold water alternately in the intervals of scrubbing. The act of bleeding, as conducted in this manner, moves a sluggish or obstructed circulation, and restores, more effectually than any other means we know, the action of the absorbent system which is so nearly connected with the function of susceptibility. When the circulation is slow so as to threaten stagnation, the colour of the blood is usually dark. It changes to a brighter red as the course becomes accelerated; and, as it flows freely and rapidly, the countenance becomes animated and clear, the stricture, impediment and suspension of function vanish, the natural sensation is restored, the pulse developes, and the disease assumes an open and active form of expression. On the other hand, where the motions are inordinately irritated, a similar subtraction of blood, particularly when made from a large orifice, moderates their violence, removes impediment, restores a juster balance throughout the system; and thus becomes the means of changing irregularity and tumult to a febrile movement of one uniform tenor,—in other words, it simplifies the disease. These facts are often witnessed in experience; and hence it appears that the subtraction of blood, when properly conducted, acts by accelerating the circulation and enlivening the febrile motions in one case, by retarding the circulation and reducing the febrile motions into a more moderate and regular order in the other. But, as it restores susceptibility of impression in both cases; and, as it is supposed to be so managed as to assure this effect, without destroying the energy of the power which is appropriated to the production of just action, it prepares the subject for the impression of such means as are capable of soliciting the train of movement into the channels of health by a direct and powerful effect; consequently, it prepares the condition for the successful affusion of cold water on the surface.

This complicated and gangrenous form of infectious fever often shews itself among those who attend upon sick persons accumulated in heaps in ill-ventilated hospitals. I am aware that part of the means, particularly the bleeding which I have recommended as preparatory of the fit condition for the application of cold water to the surface, will be severely censured by many; and therefore I cannot pass the subject without offering an explanation of that which some may hold as questionable. It appears to be common opinion, at least in so far as I am acquainted with medical opinions, that it is improper, even injurious to subtract blood by the lancet in a case of infectious fever or typhus as it is usually called, whatever form it may assume; while the practice, I believe, is generally held to be destructive in those which assume the putrid or gangrenous character. If such be in fact the opinion of medical writers, I take the liberty of saying that I have put the case to the test of experiment, and my experience does not allow me to say that it is well founded. Bleeding is not necessary; and, if improperly conducted, it may even be dangerous in the slighter and simpler forms of infectious fever. But, while I say this, I am free to maintain, from sufficient trial, that it has produced, and I believe will continue to produce decided benefit, if employed in the circumstances and according to the manner in which I employ it, whether the disease proceed from an infectious or an endemic source. Where the action is tumultuous and inordinate; or where it is as it were suspended or oppressed by some peculiarity in the mode of acting; that is, where the circulation is apparently slow and stagnating, or, where the condition is such as denotes the presence or near approach to gangrene, bleeding sometimes effects a cure by its own power:—it more certainly prepares the condition necessary for the salutary action of others, particularly for the affusion of cold water on the surface; which, after such preparation, produces a decisive and fortunate effect far exceeding the effect of any other means with which I am acquainted. This is the state of the case as verified in my own experience; and, while true in fact, it seems to me to be well supported by analogy in reasoning. The means are here employed to produce a given condition; and it will not be denied that, if conditions be the same or similar, the form of the subsequent action will also be the same or similar with the application of the same or similar powers of stimulation, whether the original disease proceed from an infectious or an endemic cause. But, setting aside my own experience on this subject, it appears to be clearly proved by the experience of Lieutenant Douglas and that of the army surgeon, mentioned by Sydenham and alluded to above, that bleeding may be employed with safety in diseases of this description. The character of the fever which was so fatal on board of the Chichester store-ship is not, I admit, explicitly defined in Lieutenant Douglas's narrative; but there are grounds to believe that, if not originally infectious, it had actually become so on the passage by the great accumulation of the sick in confined space.—It will not be disputed that the disease, which appeared in the camp at Dunstable, was of the gangrenous kind.

When due susceptibility—the point now in view, is attained, the application of cold water to the surface assumes its place; and, when properly adjusted to the case, it produces effects equally fortunate here as in the forms of fever before described. But, as the condition is a dangerous one in its own nature; and, as it is not wise to leave any thing to chance where certainty is attainable, it is incumbent upon us to employ all those collateral means within our command which are held to be capable of contributing aid to render the proceeding sure. It is thus adviseable, after the condition has been prepared in the manner stated, to add salt to the water; and, where the case occurs in warm climates, it is proper to cool the water as much as possible by exposure to the night air, or by dissolving Glauber's salts in it; and further to apply it, when so prepared, suddenly, forcibly, and in quantity. The disease is now supposed to be arrested; but that the ground which has been thus gained may be secured, and that the healthy condition be yet farther improved, it is recommended, after the skin has been wiped dry with linen towels, to rub the whole body with stimulating oils, with salt and vinegar, with lemon or lime juice; even to repeat the affusion at proper intervals, preceded and followed by such other assistances as the situation at the time may seem to indicate, or as can be attained in the circumstances in which the sick person is placed; for, it is to be remembered that as a gangrenous tendency manifests itself in the case, and, as it is known that a gangrenous process leads to stagnation and death in a part or in the whole, no means are now to be omitted which have a chance of arresting the progress, even by force; that is, of completely changing the nature and circumstances of the disease by the application of the strongest powers which the medical art commands.

And further, while we assume this principle as the base of our action, we ought also to be aware that, if we be not capable of measuring the quantity of means to be employed for the accomplishment of our purpose with precise exactness, it is better to exceed than to fall short of what is necessary. In one there may be safety; in the other there is danger; that is, the diseased course is not arrested through the timidity of the physician, and death is the consequence of our feeble exertion.

I have touched the outline of the gangrenous action arising from the impressions of a febrile cause only in a cursory manner; but it is plain, even from this cursory view, that wherever such action exists the presence of an operation which destroys life by direct effect is indicated. The application of cold water to the surface, though a salutary power and one of the strongest which the medical art acknowledges, is rarely sufficient to arrest the progress of a disease thus fatally determined. It fails, if it be not assisted and supported by collateral aids: with these, judiciously directed, it often succeeds in apparently desperate cases. I have stated generally what these aids are; but I must at the same time inform the reader that the just mode of managing them, of adjusting them in their places, and of precisely measuring their quantities so as to attain the effect with something like calculable certainty, is only to be learned correctly by personal observation and experience. The arrest of that form of action which constitutes health, and which occurs as a consequence of the impression of a morbid cause, appears in the present case to be followed by a tendency to stagnation among the circulating fluids: the action of the absorbent system is in a manner suspended, the susceptibility of impression impaired, diminished or lost; in short, the condition which sanctions the application of cold water, at least which gives it success, is not present; consequently the effect is void where the remedy is thus applied.

Advanced periods.

Warm and cold bathing, or the affusion of warm and cold water alternately upon the surface of the naked body is stated to be a remedy of value in the early stages of infectious fever, more strictly speaking perhaps within the third day. After the third or fourth at farthest, this form of disease is generally so determined in its own course, the progress towards a natural crisis so far advanced, that the impression made by the remedy in question is rarely powerful enough to correct the error abruptly, or to restore the healthy action of the system by a decisive and direct operation. The disease then, notwithstanding the copious and repeated affusions of cold water, usually pursues its own course and attains a regular termination after its own manner. But, though the cold affusion is not to be considered as the means of effecting an abrupt cure of fever when applied at the latter periods, it is, at the same time, no more than just to remark that, powerful as it is in its own nature to effect changes, it rarely occasions such changes as are contingently injurious or dangerous to life. When divested of the terrors of a first impression, the effect, and even the act is generally grateful to sensation; it moderates action where excessive; it invigorates it where weak; nay it seems often to accelerate and perfect the critical process according to its own proper form. What I now state belongs to cold affusion, employed as a remedy at the different periods of what may be called the first course of the disease. But, it is further to be remarked and remembered that where a crisis has actually taken place, and where that crisis has been followed by a relapse at an interval of some days, or, where an abatement or remission only has occurred succeeded by recurrence of disease with a change in the nature of the symptoms, the case may then be considered as in some measure a new one; and the circumstances are now to be estimated relatively according to the condition which is actually present. If the fit condition for the affusion exist, the remedy is to be applied without hesitation or delay: if it do not exist, the first view of the physician is necessarily directed to the means of preparing it artificially. The point is fixed: but the course through which it is to be attained is not always clear and easy; I shall therefore endeavour to digest some rules for the direction of the young practitioner on this important subject; which, if they do not contain all the information which may be thought to be necessary, will, I am satisfied, lead no one into error who considers them with due attention.

In fevers, which have continued for some time, and which have probably assumed a new form of action termed a second course, the preparation embraces the same fundamental view in principle as in the preceding; but the management of it is nice, the execution difficult, and the effect sometimes imperfect, even with the best care. The view, I say, consists here as in the earlier stage in simplifying the case where complicated; that is, in giving the disease a character of one expression, and particularly in directing that expression to the outer circle or surface of the body. This constitutes the outline; but it is to be remembered at the same time that, as the disease is now advanced in its course, and probably has attained such a point in its progress that it cannot be precipitately arrested with safety and effect, the plan of cure moves only in a humble path; it is in fact often entangled in an intricate one. If the movements of the disease be regular, advancing progressively to a critical period according to the common law of the febrile course, the appearances indicating at the same time a fair prospect of favourable termination, the adoption of such bold and decisive measures as arrest its progress at once is not justifiable: it is superfluous, and it is not certain but it may be dangerous: on the contrary, where the movements are irregular, and where appearances are threatening, the dangerous chances are to be obviated by the adoption of energetic measures. The truth of the position will not be controverted; but the execution of the purpose is not easily effected. The condition of the subject rarely admits of bold practice in the latter stages of the disease; for, those copious or profuse general evacuations which are calculated to produce decisive changes, and which may be employed with safety at earlier periods, are not now admissible; yet it is evident that the advanced stage of fever frequently presents a complication of form, viz. inflammations or organic congestions which can only be resolved by means of evacuation, general or local; a circumstance, which renders the management of the preparation previously to the application of cold water to the surface a matter of the greatest nicety.—I shall notice the rules of management in detail.

1. When fever presents itself in the advanced or second stage, whether a relapse after crisis, or merely a changed form after a short or scarcely perceptible abatement, the affusion of cold water on the surface is often found to be decisive in arresting the progress of the disease, even in assuring the recovery of health. In the first instance, viz. in the case of relapse where the susceptibility of the system is not impaired, and particularly where high susceptibility is accompanied with expressions of lively heat in the surface, with acute, but fleeting pains of the head and limbs, with energy of vascular action, easy respiration, absence of internal pains and exemption from all marks of internal congestion; in short, where the condition nearly resembles that described in the preceding pages as belonging to the first form of fever at its commencement, though presented here in the more advanced stage or after a relapse, the affusion of cold water on the surface, or complete ablution of the skin may be employed at once—with freedom, with safety, and with reasonable expectation of arresting the course of the disease abruptly.

2. In fever, which manifests an excess of mobility, which is characterized by fainting or a disposition to faint with change of posture, and which shews withal a soft and open state of the surface, a frequent and compressible pulse, a degree of heat very little if at all increased above natural, even perhaps not so high as it is in health, the skin at the same time retaining its sensibility through all its parts, the respiration being easy and free, and no marks of congestion being discoverable in the internal organs, aspersion, or complete ablution with cold water, particularly with cold salt water, assumes its place, and, even at a late stage of the disease, presents itself as a safe remedy, and a powerful one productive of beneficial effects, though not generally of such abrupt arrest of the diseased course as happens when it is employed at the earlier periods. In consequence of the application of cold water to the surface in the circumstances described, all the organic actions assume a new tone of movement; the excessive mobility is moderated, even the superficial heat, where deficient, is manifestly increased and the final result is usually fortunate. The fact is true, and it is of some value to be remembered; but I may farther add that where the animal actions are particularly debilitated, viz. where the sphincter muscles lose their power of

contraction in so much that the urinary and fecal discharges pass involuntarily or unconsciously, that speech faulters or fails, that the power of swallowing is impaired or lost ; even where the intellectual operations are so far disturbed that various forms of delirium appear and disappear at uncertain intervals ; in short, where the whole actions of animal and organic life move unsteadily, aspersion or ablution with cold water, more particularly as saturated with salt, produces great effect, often reviving and renewing the effective movements of health as if by the power of a charm. But, where things turn out so fortunately as is here expressed, it must be understood to be an essential condition, that no congestion in any of the more important internal organs exists ; in short, it is understood that the disease is here principally manifested in the movements of the muscular parts, the surface of the body, or organs of sensation. As susceptibility of impression is the leading point which ensures the effective action of cold water when applied to the surface of the febrile subject ; so, as susceptibility exists in excess in the case under view, the preparation now instituted is reasonably supposed to be such as is calculated to moderate, or to diminish excess rather than to increase it. Hence, in correspondence with this view, I direct a glass of wine or other cordial to be administered previously to the application of the cold water externally; and farther, instead of the copious affusion by means of buckets or such other vessels, I hold it to be safer, and, in cases similar to that stated, I find it to be sufficiently powerful to apply it through sponges—by aspersion, or at most by general ablution. I am well convinced, by experience, that the remedy is safe when applied by aspersion in the circumstances to which I allude: but I do not know that it may not be dangerous, even that it may not actually arrest the course of life where the water is of a low temperature, and where it is applied copiously by affusion, if there exists a condition of weakness and mobility like that I have now described *.

3. In the advanced periods of fever, where signs of stagnation manifest themselves generally in the venous system, presenting petechiæ and various forms of lividness; and more especial-

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* The safety of applying cold water by aspersion in Europe, or cold salt water by affusion in tropical climates, in cases of extreme mobility, is sufficiently proved by my own experience; but to that I may add the experiment which Dr Pinckard made in his own person. The ardour of the fever had there abated; the pulse, though weak, was not much quicker than natural, and this was accompanied with general languor and prostration of strength in the most extreme degree. His words are to this effect: "*I was lifted out of bed into an empty bathing-tub, and calabashes of cold sea water*

ly, where such appearances are accompanied with marks of congestion in some one of the internal organs, particularly the thoracic or abdominal, the condition which encourages us to expect benefit from the application of cold water to the surface does not exist; and, while it does not exist as the case presents itself, the circumstances are often so complicated that the just means of giving it are not easily ascertained, and, when ascertained, are not always easily applied so as to reach the end with safety and effect. In the case now under view, the surface of the body is often colder than it naturally is in health; sometimes it is dry, bloated and harsh; sometimes greasy, damp, and flaccid: the pulse is sometimes slow and regular in time, but without force and energy in manner; sometimes it is frequent and irregular,—small or without expansion. The condition now noticed is sometimes general, and as it were equally expressed through the whole extent of the sys-

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were dashed upon my naked person with an effect which exceeds all description. Not only were the sensations of the moment inconceivably refreshing and delightful, but the more durable and important benefits were equally striking. Previous to bathing I fainted, only on my head being lifted up from the pillow, but after I was taken out of the tub I was able, with due support, to sit up for nearly ten minutes, while three persons, with rough cloths, rubbed me dry."

Pinckard's Notes, vol. iii. p. 145.

tem; sometimes it is combined with a prominent local affection; in which case, the function of some one of the internal organs, frequently the lungs, is particularly oppressed, in so much that breathing is short and laborious,—the act of respiration not performed without an extra effort of the diaphragm and surrounding muscles. The circulation of the blood is here languid throughout; and, in the complicated case alluded to, it probably already stagnates in the substance of a particular organ. The subtraction of blood, as has been said and as may be supposed to be proved in what is stated above, is an obvious remedy in relief of stagnation whether general or local; but, as it is here applied to a dangerous case, and, as it will do no good if it be not conducted with great skill and attention to circumstances, the effect is not always fortunate; consequently it is liable to be judged,—and it is in fact often judged and condemned unfairly. The remedy has here to meet a dangerous condition of disease; the chances of which ought to be estimated abstractedly. I do not maintain that it may not sometimes fail, even if applied with all the skill that our science has yet attained; but I can safely say, from numerous testimonies in my own experience, that, if it do not effect a cure by its own power in an abrupt and decisive manner, it seldom fails in beginning a movement, which, if properly improved, leads to recovery in the end. As the proceeding to which I advert is not a common one; and, as it will perhaps be considered by many to be a dangerous one, I shall detail circumstantially the steps of the process employed by me for carrying it into effect. In the condition which I have described above, whether manifested in the circulating system generally or in a particular organ predominantly, the limbs and greater part of the body are to be wrapped in a blanket wrung out of hot salt water, the fomentation continued by a succession of blankets till signs of revived animation manifest themselves in the ordinary actions of the system. The vein is then to be opened, the blood encouraged to flow, and permitted to flow till an alteration be perceived in the mode and manner of circulation,—a point which is judged by an attentive consideration of the pulse. This point being gained; the face and uncovered parts of the body are to be sprinkled with cold salt water, while wine, spirits, or other cordial and refreshing liquor is to be given occasionally as the blood is yet flowing from the vein. When it is evident that the condition of the circulation has been sufficiently changed by the effect of the means now mentioned, and that the body is in fact thereby become more susceptible of external impression, the subject is to be removed into the open air, protected from, or exposed to the impulse of weather in such manner as may be judged most suitable in the existing circumstances, transported in an open carriage, cart, waggon, or wheel-barrow, the face and upper parts of the body freely exposed and occasionally sprinkled with water, vinegar, or aromatic spirits.—This is the outline of the preparation, and the mode of applying the cold water to the surface which I recommend and adopt in conditions of disease similar to that which I have here noticed. I submit it to the mature consideration of the scientific and liberal-minded physician. I am aware that it may appear rash and that it will actually be esteemed so by those who view it superficially ; but I have good reasons to bear me out in the opinion that, if the parts of the process which I have now mentioned be properly combined and prosecuted with a persevering attention, a fellow-creature may be often rescued by means of it from the very jaws of death *.

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* I cannot but be desirous of adducing some authority of respect which may help to bear me out in my opinion concerning the safety and effect of the practice here described ; but the small collection of books to which I have access does not enable me to give all the satisfaction in the case which it is capable of receiving ; I believe however that the practice of the faithful and candid Sydenham in the instance of Dr Morrice, physician at Peterborough, will be admitted by the un-

I have thus detailed, at some length, the mode of preparing the subject, and of applying cold water to the surface as a remedy for the cure of infectious fever in its various stages and degrees. The remedy is, perhaps, more to be depended upon in this than in any other of the forms of acute disease. The favourable condition often presents itself naturally in diseases of this class; or it is prepared easily and obviously by artificial means, even sometimes attained without design by acts which are implied in disposing the sick for systematic medical treatment in a regular hospi-

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prejudiced to rest on the same base with that which I have here detailed, though it was not attained through the same chain of reasoning. "*Stante hac constitutione accersebar ad virum doctissimum Dr. D. Morrice (qui, tunc temporis, Londini, jam Petwerthiæ medicinam cum laude facit) hac febre, cum effusissimis sudoribus et frequentibus petechiis laborantem; consentientibus aliis aliquot medicis utrique nostrum familiaribus, vena secta fuit, surrexit e lecto, absterso primum sudore, medicamentis et diæta refrigerantibus usus est, præsentissimo cum levamine, multis malis atque periculosis symptomatis mox difflatis; et, cum eidem modo insisteret, intra paucos dies sanitati restitutus est.*" Syden. Op. p. 130. The act of bleeding, with the existence of petechiæ, the rising from bed and consequent exposure to cooler and purer air after the operation was finished, may be considered as a practice nearly allied with that here recommended. It seems to me to open a view of the principle upon which I act; and, if my practice should not be adopted in the present time, it will at least escape gross reprobation as it is in some measure shielded by the authority of Sydenham.

tal; for instance, by purifying and new-clothing the dirty manufacturer at his removal from a damp and foul cellar to a clean and airy apartment; or by a like discipline practised upon the body of a soldier incrusted with dirt through neglect, or whitened with pipe-clay in compliance with regulation at his transfer from a confined and crowded barrack-room, or the 'tween-decks of a transport-ship to a well-regulated hospital, or an airy private sick-quarter. The act of transport, aided by subsequent purification, produces a manifest change of condition; and, in consequence of such change, the balance under which the diseased action subsisted is necessarily disturbed, perhaps subverted, the disease removed, or its removal facilitated. In this form of fever, the very organization of the constitution itself, if one may so speak, pants after the inspiration of pure air and delights in the aspersion of cool and pure water. I may here be allowed to judge of what I have felt in experience, viz. that, after associating with a mass of sick persons in the atmosphere of an infected hospital, I have drawn in the breezes of fresh air with eagerness when released from my duty; and, after such release, I have even regaled myself under such heavy and continued rains as would have been unpleasant in other circumstances, and which, as such, I would have been desirous to avoid.—We are in fact eager of pure air and cold water in the situation described; and we are refreshed by their application in a similar manner as a thirsty and scorched plant is revived by a shower of summer rain.

Endemic fever.

The impression of a cause arising from a source of personal infection produces fever; the impression of a cause arising from soil likewise produces fever; different, however, in its nature and character from the preceding, though the distinctive difference is sometimes so obscure as not to be capable of being intelligibly committed to verbal description. The disease comprehended within the general outline of endemic exhibits considerable variety of form, and great difference in degree of force: this we presume it partly owes to difference in force and modification of cause. The endemic has two extremes, viz. closely continued, and distinctly intermitting, with many intermediate and mixed conditions. The form of action which it assumes is for the most part strongly declared in the organs of the great circulation; and, as the action of the vascular system is often highly increased, so the termination of the disease, or of a paroxysm of the disease is ordinarily accompanied by copious evacuation, viz. sweating, or other excretion.—I here describe the forms and varieties of endemic fever, only in so far as such description is connected with those circumstances, which encourage or dissuade from the trial of the affusion of cold water as a power calculated to arrest the progress of the disease, or to ameliorate its condition. And I have to remark farther that, as my descriptions are drawn chiefly from what I observed in tropical climates, so my practical rule is principally founded on my experience while I was employed on foreign service.

Febrile diseases are ordinarily more genuine in character and more intense in degree in tropical, than in temperate latitudes; consequently the history is more easily marked, and the rule of treating them is capable of being presented in a clearer point of view in the one scene than in the other. But, though my description be drawn from, and my mode of cure chiefly directed by what I saw in hot countries, I add that if the foundations, as laid on this ground, be really just in themselves, the discerning physician will have no difficulty in discovering what belongs to each respectively, or in fixing the rule which ought to guide his practice where situations relatively change. The affusion of cold water on the surface, or warm and cold bathing employed alternately, presents itself in the endemic, no less than in the infectious fever as a remedy of great power and beneficial effect; but the success or failure of its action depends upon the fit condition of the subject, whether that exist naturally in the form of action which the disease assumes, or whether it be attained artificially by the rule of preparation which the judgment of the physician institutes.

First—mild form, or simple condition.

Having premised these remarks, I now proceed to consider the disease more particularly, and I divide it into three leading forms:—The continued fever of tropical climates frequently appears in so mild a form that the subject is easily susceptible of impression; sometimes in fact the susceptibility is preternaturally increased; consequently remedies act effectively, and thence the affusion of cold water may be made with safety, and with expectation of benefit without previous preparation of condition. The appearance of such form, often denominated yellow fever in the West Indies, is probably influenced in every part of that country by the general constitution of the season; but it more commonly presents itself in level districts, where there is less variation of temperature than in hilly situations interspersed with ravines, through which winds, relatively cold and piercing, issue as through a funnel, especially during night. And, for a similar reason, it would seem to occur oftener among sailors on board of ship, where there is little vicissitude in the temperature of the air, than among soldiers on shore, who are exposed occasionally, and often unwarily to heat at noon and cold at night. But from whatever cause, or under whatever condition, a fever of continued form may arise, distinguished by active movement, and violence only of a second rate, in such condition, the affusion of cold water on the surface, even when made without any material previous preparation, frequently cuts short the course precipitately and restores a form of action, which, in its subsequent progress, proceeds securely in the channels of health. The circumstances of disease, which are warrant for this fortunate event, appear to be connected with the following outline, viz. a pulse, frequent and quick, compressible, but expansive; pain in the head, or in other parts of the body—acute, severe, and changeable, rather than dull, obscure and fixed; the eye sometimes muddy,—confused and watery; sometimes brilliant and glistening; the countenance lightly flushed, the colour florid and bright, rather than deep and grim; the heat superficial and glowing, rather than intense and concentrated.—To these may be added, fainting, or disposition to faint with change of posture, fluctuating movement among the organic actions, irregular pains, sometimes severe spasms; in short, appearances of such a varying character as denote that the habit is easily susceptible of impression; while there, at the same time, exists evidence of power to produce effective action with the application of suitable stimulation. When the circumstances now stated are present, the fit condition is supposed to be prepared; the effect of the cold affusion may then reasonably be expected to be decisive of cure, at least productive of benefit *.

Violent, masked or complicated forms.

In the form last described, a condition of system easily susceptible of impression exists naturally; consequently no artificial preparation of the subject is commanded to be made. In the forms to be hereafter noticed, the requisite condition is not present according to the natural presentation of things; conse-

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* The milder form of continued fever here noticed, and which stands as the second species of yellow fever in my treatise on the Fevers of Jamaica published in the year 1791, presented itself frequently at Savanna la Mar between the years 1774 and 1778, particularly among seafaring people, strangers in the island: and I may add that a similar disease, viz. a disease of a second rate of violence, would appear to have presented itself to Mr Nagle, surgeon of the Ganges ship of war, in the year 1802.—Medical Reports, vol. ii. p. 134. In this form of disease, Mr Nagle's practice and that which I followed correspond pretty nearly, as may be collected from what is said in my treatise on the Fevers of Jamaica alluded to above: I do not recommend bleeding in the milder forms; I even forbid evacuations, previously to the affusion of cold water on the surface, in the low and slighter fevers of tropical climates.

quently it is to be given artificially by suitable, but varying means of management. The first and principal condition, which impedes the favourable operation of the affusion of cold water on the surface as a remedy for the cure of fever, consists in the existence of torpor or insensibility to impression, however produced. Whether the insensibility, alluded to, be the consequence of a strong action of the cause of the disease, so directed as to excite a rapid movement, determined in its course towards a given point and little sensible of the impression of causes of ordinary force which are applied to arrest it; or, whether it be connected with venous distension and sluggish circulation from the pressure of quantity, generally or locally; or, whether it depend, though less intelligibly, upon a suspensive effect which the cause of the disease produces upon the powers of motion, the affusion of cold water on the surface, though a powerful instrument to occasion changes in conditions of fever of inferior force or simple form, is here a feeble remedy; a remedy in short, from the action of which a fortunate movement, at least a decided termination of the diseased course is not to be expected.

The unfavourable conditions, in so far as respects the practical view, may, I think, be arranged under two general heads; viz. a tumultuous and irritated form; or a form that is sluggish in its course and directly gangrenous in its character; either of which may be manifested in the system generally, or complicated with local inflammation, or local congestion. The first presents itself under the following appearances: the pain of the head is violent and constant, the brain seeming bound and constricted as if it suffered some unusual pressure; the pains of the loins and limbs are racking and deep seated, the sensations accompanying them singular as if all the connections of organic movement were dislocated and unhinged; the agitation in the circulating system is violent in degree, and unusual in manner; the pulse hard and tense—without expansion and freedom; sometimes frequent and tumultuously agitated as if struggling against an opposing resistance. Respiration is hurried, almost to panting,—and the breath is hot. The countenance is confused, more or less agitated; the colour high, deep and sometimes dark,—in contradistinction to the transient, florid and superficial flushings of the form last described. The eye is red, hot, painful and agitated; often turgid, as if ready to start. The body is hot; the heat strong and ardent, deep seated and of one uniform tenor,—that is, like the heat of a burning coal; the skin is dry and constricted, thick and compacted as if its functions

Tumultuous and irritated form.

were suspended. The mouth and tongue are frequently dry; the thirst often great; the urine high coloured and scanty; the secretions impaired, sometimes in a manner abolished: and upon the whole, susceptibility of impression is so veiled by strong and forward action, which has no distinct pause of relaxation that those powers, which are usually called stimulating, are now found to be nearly inert. Hence blisters do not rise freely: they produce no discharge, or only a scanty one: also purgatives, even of the most active kind, are often exhibited in large doses without effectively moving the bowels.

In a case of fever manifesting symptoms of the nature and degree of concentration now described, whether in a tropical or a temperate climate, the affusion of cold water of moderate temperature probably refreshes the patient and affords temporary relief; but it rarely arrests the course of the disease, or effectively restores the health at once, as often, indeed as usually happens in the former case. As the remedy therefore, simply in itself, does not appear to be sufficiently powerful to control and decidedly to arrest the course of a disease which manifests such domineering force of action, it is obvious that the excessive action which opposes the effect is to be previously reduced to such a point of balance, by accessory helps, that the power of the cold water be raised high relatively, that is, rendered equal to, or rather superior to its purpose; for it is consonant with reason, and it is proved in the experience which I have occasionally witnessed that, without such balance in its favour, no decisive or permanent change will be effected in consequence of its application. I hence conclude that a certain form of preparation of subject is necessary to ensure the success of this remedy; and I have learned from trial that a large quantity of blood, subtracted suddenly from a vein, constitutes the first and most important means of accomplishing this purpose: And further, as bleeding is the means employed to attain the end, the quantity to be taken away is to be measured by the effect which arises in the course of the process,—not by preconceived opinion of what may be sufficient; for few possess, or can be supposed to possess such knowledge of the nature of things as to be capable of measuring it with exactness in the prescription-book. The effect here looked for, and it is effect which is to decide the measure of the quantity, implies remission of pains of all denominations, relaxation of the skin, freedom in all the secretory functions and change in the condition of the pulse; which, instead of being hard, tense and tumultuously agitated, becomes free, open and regular. It is not possible perhaps for any one to determine, *à priori*, the precise quantity of blood to be taken away in order to accomplish this purpose. It is evident that it must differ in different persons according to the constitutional qualities of the subject, the force, or complication in the form of the disease; but, whatever may be the precise quantity necessary to produce the effect, it must always be supposed to stand high, seldom lower than thirty ounces,—in strong athletic European soldiers, recently transported to a tropical climate, sometimes far above it. The quantity here stated will, I doubt not, startle the cautious physician of the fashionable circles of society in this country; and it probably might be dangerous as applied to the delicate subjects which fall under his care; but the military physician may be assured that bleeding to the extent stated, and even higher, implies no danger in the case now described; and he may be further assured that he has no right to promise himself perfect success from the application of other means where this primary step is defective. I hold subtraction of blood in large quantity, and I am well supported by my own experience, and even by that of others, to be a most decisive process, in the more intense and concentrated forms of the endemic fever of the West Indies, for producing the susceptible condition here required; as I also know that the copious affusion of cold water, on the surface, is a most effectual remedy for arresting the febrile movement, and restoring the action of health when this condition is previously produced, whether by bleeding or other means. The arrest of the existing train of diseased action, however produced, affords an opportunity for that which belongs to health to resume its course; and it is even probable that the impression made in this case by the affusion of cold water, while it effects an arrest of the disease, brings the parts into such point of contact that a new and regular form of action ensues, in consequence of the new form of condition thus produced; hence the disease ceases, and health is restored in full vigour. This we observe to be the fact, and I may further remark on this head that after blood has been subtracted in the extent stated, a slight aspersion with cold water gives stronger impression, and is followed by a more complete effect than the affusion of many gallons of colder water without the preparation alluded to. My own experience in different climates furnishes ample testimony of the truth of this position; even the practice of Mr Wilson, surgeon of the Hussar, noticed at page 117 of the second vol. of the Medical Reports, gives cause to believe that bleeding actually prepares a favourable condition, and that the power of the cold affusion was in reality increased by the mode of practice instituted for the crew of the Hussar, at Hallifax in Nova Scotia :—the event proves decidedly that previous evacuation was not unfavourable to the success of the effect, or dangerous to the life of the patient.

Third form —stagnated or gangrenous.

3. The condition of excessive irritation or fulness, which, in consequence of a rapid or otherwise morbid figure of action, shields the susceptible organ, if I may be allowed so to speak, from the impression of causes of ordinary force, is changed or removed completely as has been just now said by the direct abstraction of blood. Such conditions present themselves frequently in the endemic fever of tropical climates, particularly in the fevers which happen to Europeans soon after their arrival in tropical latitudes. But besides this, another, different in aspect and still more formidable from its dangers, appears not rarely among European soldiers, as they are acted upon by contingent causes, especially as they are accumulated in ill-ventilated quarters, or in transport ships in excessively hot and dry weather. In the form of fever to which I allude, the affusion of cold water on the surface, powerful as it is held to be, is not sufficiently powerful to ensure

a fortunate change of the existing circumstances. The functions are here impaired; the sensibility is suspended generally, and, without previous preparation of the subject, the remedy is applied with no certain effect. The following is the outline of this form of disease.

The patient complains of a dull and oppressive pain of the head; the general sense is torpid, that is, slow in indicating the impression of powers applied to it; the functions are impaired, or in some measure suspended; the pulse is sluggish, the stroke without just expansion and just energy of contraction; sometimes it is convulsively tumultuous, sometimes it creeps obscurely; it is sometimes repeated at short intervals, sometimes the frequency is not much greater than natural; but the stroke always deviates, and deviates widely from the pulse of a person in health. Together with this disturbed condition of the pulse, the respiration is impeded; sometimes it is interrupted by deep sighing, the expansion of the lungs being restrained by undescribable impediment, accompanied with a sense of defective power different from that form of restraint which is connected with local pain. The nature of this inability to expand the chest is scarcely as I have just now said to be defined in words; but such inability often exists, and the existence of it marks a dangerous condition of disease. We are not able to define its character clearly; but the cause which occasions it is manifest in dissection after death, the lungs being then generally so gorged and suffocated as to resemble a sponge filled with blood. In persons who are thus affected, the colour of the skin has a livid tinge; it is sometimes dark and marbled,—dusky like mahogany; or dingy and withered like the leaf of a fading plant; the countenance is heavy and inanimate,—dark, grim and clouded; the eye vacant and without expression, sometimes unusually white and glossy —but without animation: the heat of the surface is sometimes moderately increased, sometimes not increased beyond the natural temperature; the deeper seated heat, as judged by sensation when the hand is pressed strongly on the trunk and covered parts of the body, is sometimes considerable; and, while this is so, the forehead and extreme parts are often cold and clammy as is usual in agonies of pain and distress: the natural secretions and excretions are diminished, suspended or perverted; little or nothing passes off by exhalation, and little or nothing seems to be taken in by absorption; the functions of the organic system are impaired generally, and those of the alimentary canal are particularly torpid and inefficient; in so much that the strongest cathartics have little or no effect in moving the bowels: the skin is thick —often dry, sometimes clammy and greasy—without a just degree of animation; hence it is not affected in the usual manner by the stimulation of blisters. This condition of disease often comes on suddenly; and it often subsides rapidly and directly in the gangrenous termination without the developement of open previous excitement; sometimes it creeps on silently, but slowly, the subject appearing to wither and decay gradually like a vegetable deprived of nourishment. To arrest the progress of a disease of this fatal character, even in the beginning of its course, is not an easy undertaking. It demands a remedy of no ordinary force; and the affusion of cold water on the surface, even when cooled artificially and applied in large quantity, powerful as it is in impressing a new form of action throughout the organic system, is not to be trusted in the case described as a remedy of sure effect—without some previous preparation of condition. It may be understood from what has been said above, that the successful action of cold affusion is necessarily connected with a previous condition of great susceptibility. It is evident that this does not exist in the case stated; and, while this is admitted, it is moreover plain that the process, through which it is to be given, comprehends a series of operations of a somewhat complex nature, and which are not always easily managed and adjusted. The subtraction of blood is the first important step in the preparatory process; but, though essential, there is sometimes difficulty in carrying it to the proper point in extent. If we open a vein in a case of stagnated circulation like that now alluded to, the blood flows slowly and interruptedly at first, even though the orifice be a large one. As this is the case, it requires management, viz. frictions, fomentations and aspersions with cold water, or stimulating applications to urge it forward in its course. As it begins to flow freely, the countenance usually brightens, the oppressive pains vanish, or change to painful sensations of a slight and moveable nature; the languid motions are animated; the exhalants relax, and the absorbents re-assume their office; in short, a condition is produced which is susceptible of impression; and a foundation is thus laid for the affusion of cold water on the surface, which now becomes a remedy in which confidence may be securely placed. The condition here implied is often attained by the effect of bleeding solely; but, it is attained more speedily and perhaps more completely, if the extremities be immersed in a tub of warm water, if they be fomented with hot flannel cloths, and if the cold water be poured upon the head and houlders in copious streams while the blood is yet flowing from the arm. The change, thus made, is made by the effect of force ; and, we have grounds to conclude that if the just and healthy action be thus restored temporarily, the continuance of it may be maintained and secured permanently by frictions with stimulating oils, camphorated spirits, vinegar, juice of limes or lemons, and by frequent affusions of salt water, the cold of which in tropical countries ought to be artificially increased by the solution of salt.

The form of disease, the history and treatment of which I have now noticed cursorily, is frequent in tropical climates in excessively hot and dry weather, or under the action of certain contingent causes, particularly the accumulation of persons of a full habit in ill-ventilated quarters. The truth of this position was strongly exemplified in St Domingo, in the year 1796. Detachments of troops were embarked at the Mole St Nicholas, in the excessively hot weather of June, July, and August, to be conveyed to the other stations in the island. They were embarked in all cases in perfect health ; and, in two or three days, at least within the fifth, which was the extent of the longest voyage, one-third of the number was generally in the sick-list, and of those who became sick nearly one-half died :—the duration of the disease seldom extended beyond the fifth day. The York Hussars, a body of choice men in external appearance, furnished a strong instance of the sickness and mortality alluded to. This corps, five hundred strong, was ordered to St Marc for the service of that garrison. It embarked at the Mole in perfect health; and, in three days, two hundred persons were in the sick-list, and by the end of the first week one hundred were numbered with the dead. The sickness and consequent mortality bore nearly the same proportion in a small detachment of the 69th Infantry, which was sent from the Mole in the beginning of June; as also in the 29th Cavalry, which embarked for Port au Prince towards the latter end of that month. The above-mentioned troops had lived on shore for a short time in a comparatively free and open air: they were embarked in health, and in wholesome transports, but in dry and very hot weather. The sickness which occurred was instantaneous,—such in its suddenness and character as does not arise through a regular process of personal infection; it was gangrenous in its course and termination, either directly or secondarily; and there seemed to be no cause present which could account for such effect, except unusual heat and an accumulated mass of people on the decks, or in the 'tween-decks of the ship. This sickness and mortality happened chiefly on the passage in the corps now mentioned; a similar degree of it occurred among the Rohan Hussars after landing at Port au Prince in the month of June. The weather had been for some time unusually dry, and it was excessively hot: the barracks were crowded as well as the hospitals, and the mortality was prodigious,—the disease often gangrenous by direct effect. The sickness abated, and the mortality diminished among those who were sick, when the remainder of the corps was dispersed in quarters in the plain Cul de Sac, more particularly after a fall of rain; for, as far as I have observed, it is in very dry and hot weather that this gangrenous and mortal character is most conspicuous.

I am aware that the subtraction of blood, which I recommend in this stagnant or gangrenous form of fever, will not meet with the approbation of the generality of medical readers; but I must be allowed to say that my own experience proves the safety and efficiency of it in the most unequivocal manner,—not perhaps as a remedy capable of completely arresting the disease by its own power, but decidedly as a remedy capable of preparing the condition under which cold water may be applied to the surface with every expectation of benefit. I noticed, in a preceding part of this work, the extraordinary success of bleeding in the hands of an army-surgeon in a gangrenous or pestilential fever which prevailed in the camp at Dunstable, during the civil wars in England, as mentioned by Sydenham on the authority of Colonel Windham. The fact is authentic, and it seems to me to furnish a very apposite illustration of the practice which I now recommend; for we must admit that wherever circulation stagnates in the early periods of fever, whether it stagnate as an effect produced by the concentration of a common cause, or by the action of an adventitious or epidemic one, the means of relief are necessarily the same.

Advanced periods.

The conditions described above are conditions of fever in its early stage, when the powers of medicine are in some manner capable of being rendered absolute. The effect is then calculable and sure; but it sometimes, indeed not unfrequently happens, as things are disposed in the ordinary arrangements of human society, that the case is not submitted to the physician's care till a late period; in fact, not till a period, when the progress of the disease is so far advanced towards destruction that the known means of averting it are inadequate;—the effect of remedies is then imperfect, sometimes altogether abortive.

In the advanced or latter stage of the first form of continued fever described above, in the early period of which I observed that cold water might be applied to the surface, safely and often successfully, without previous preparation of subject, the circumstances are now sometimes so complicated and obscure, as not to admit of the employment of such powerful means without previous adjustment of condition: and further, even when that condition is adjusted, not to admit of the affusion without great circumspection and care in the mode of application. The form of disease alluded to advances in its progress to a given termination, if not cut short artificially by force; and, as it advances, it presents three apparently distinct aspects in the progress of its course: of these, the following is the outline, discriminated not throughout, but only in so far as respects the circumstances which are connected with the means of cure which form the principal subject of this work. 1. In one condition of this form of fever, the pulse is small throughout, or, from open and expansile, it becomes small, unusually soft, weak or compressible; though it still continues distinct, regular and of but moderate frequency: the heat is rarely much increased; the skin is soft, open and free, in contradistinction to thick, constricted and dry: there is even sweat or perspiration in many cases; but it is not copious, warm and fluid; or if copious, it is loathsome and unpleasant, the odour peculiar, or like the smell of fish which have been long in market: the lips are of a beautiful cherry red, the cheeks of an unusual fine bloom as if they were highly painted. The organic functions are generally disturbed; the secretions are impeded, or changed in some form or other; but they are changed after a manner which cannot be easily described in words, and which, were description attempted, would not be intelligible to those who have not witnessed the disease in all its history. Here aspersion or ablution with cold water, especially with cold salt water, is a remedy of value, but it is not a decisive and final one. The circumstances are often complicated; and it is a general rule, always to be held in view in the treatment of diseases, that if complications or internal congestions exist,—a point which cannot be determined with precision except by actual and careful examination of the case, the complications must be previously unfolded, the congestions removed, the system rendered susceptible generally, before cold water, the great and powerful remedy for the arrest of the febrile course, can be applied with safety and with expectation of complete effect. 2. In another condition of this primary form, the skin and countenance, after a certain period, become dirty as if they had been washed with dirty or greasy water:

this, in fact, is so much the case that no form of purification is capable of restoring the fresh and natural hue of health. This dusky colour, which is sometimes observable on the second or third day, becomes gradually more and more intense as the disease advances, the visage and whole surface of the body appearing grey, damp and greasy, or dry and shrivelled like the skin of a withered apple, or dirty green like a Spanish olive. When blisters are applied to the skin in the condition described, there is rarely any vesication in consequence of the irritation, — the part however ordinarily withers faster than others. In this situation there is rarely any material increase of external heat; the pulse is but little disturbed; when superficially examined, it seems almost natural; more minutely considered, it is found to be deficient in force and energy: the natural secretions and excretions are impeded or impaired; the eye is muddy, the veins turgid as if injected; the white grey and marcid, almost like tallow in a certain state of rancidity, not strictly speaking yellow like orange as happens in some other forms of West Indian fever. The sensations are distressing in an unusual degree; but the patient is rarely capable of explaining precisely in what manner they are so: the tongue is sometimes, indeed generally dry and rough; the thirst is sometimes urgent; the taste in the mouth is unpleasant, and often in the latter stages of the disease sweet and peculiarly nauseous. This may be considered as a forerunner of oozings of blood from the gums, tongue and whole tract of the alimentary canal. The putrefactive process is here slow and silent; it exhibits a gradual withering and decay; and its course rarely terminates in death before the sixth, sometimes not before the eighth or tenth day. If a disease of the character described be presented to the inexperienced physician, it is probable he may be induced to make trial of the cold affusion; for the case is dangerous, or rather desperate; and it is not unusual with practitioners to risk bold remedies in forlorn cases, without sufficiently considering the why or wherefore. But however powerful this remedy may be in arresting the course of fevers generally, I think I am warranted to say that it will be applied to little purpose in the circumstances now described—without the aid of other means; yet I am also confident in my opinion, that it may be so employed, in combination with others, as to promote and perhaps to ensure the salutary effect which is here sought for. The means to which I allude consist in rubbing the whole body with a strong pickle of salt, nitre and vinegar, with lime or lemon juice, and with warm and stimulating oils,—with turpentine, spirits of wine and camphire, &c. It even promises something, and it deserves trial though I have never made trial of it, to envelope the whole or greater part of the body in a poultice of yeast and oatmeal. The effect of the yeast poultice in resisting the gangrenous tendency, even in removing the gangrenous effect is well known; and it is probable, even more than probable, that it might be employed with benefit in the case in question. The whole of the cure in principle and practice is here a measure of force; and, as it is evident that the circulation has nearly stagnated, the mass of the blood accumulating in the larger internal trunks and veins of the internal organs, the renewal of motion, thus languid or stagnant, is preliminary to every expectation of success; and, while this is so, it is at the same time demonstrative that motion, in the sanguiferous system, cannot be removed or accelerated so effectually by any other means as by opening a vein. This suggestion, contrary to common opinion as it may be, cannot be supposed to imply danger in itself in a case tending certainly to destruction; on the other hand, viewed in the light of soliciting movement in the organ of circulation, while the animation of the circulation is essential to the preservation of life and recovery of health, it must in fact be considered as a necessary preparatory step in instituting a plan of cure. Together however with subtraction of blood, instituted for the purpose of beginning or accelerating movement among the stagnating fluids, and supported by the external applications already noticed and calculated to stimulate the whole exterior circumference of the body to new and salutary action, some internal remedies may be employed to contribute aid, though the cure cannot be solely trusted to their power. Among these are to be ranked wine, brisk champaign perhaps in preference to others, bottled porter, cyder, water strongly impregnated with carbonic acid gas by the mouth and by glyster, essence of spruce, yeast, alum, zinc, and camphire, variously combined and in large quantity; to which ought to be added gestations in the open air in carts and carriages, with frequent aspersions of cold salt water. 3. In the third condition of this form, the locomotive powers are more visibly affected in the progress of the disease than the more immediate organs of circulation. The susceptibility of external impression is unimpaired; in some instances it appears to be preternaturally increased as a consequence of the form of action which the disease assumes: blisters rise well and discharge freely; the pulse is often frequent, quick and energetic; sometimes it is small, frequent and easily compressed; it is always such as marks the susceptible state of the system to be unimpaired, often such as marks the mobility to be excessively increased. There is thus a disposition to faint with every change of posture, often tremors and startings in all their threatening forms: delirium is not unusual; and, in the more animated modes of the febrile action, it assumes figures of various and changeable expression. In other cases, the sphincter muscles are resolved, speech faulters or fails; the powers of swallowing are impaired; the urinary, and even the fecal discharges pass involuntarily or unconsciously; in short, the action of life, in all its phases, is ticklish in the extreme,—its continuance uncertain. Together with this, the skin is often cool and moist, even covered with a fluid sweat sensibly colder to the hand of the person who touches the body than the natural temperature, even perhaps colder than the temperature of the surrounding atmosphere.—Such are a few of the leading circumstances in this form of disease: the case seems to be of extreme danger, though it is perhaps less so in reality than in appearance; for, we here rarely find any marks of congestion or oppression in the internal organs; the respiration is ordinarily free and easy; and upon the whole, the force of the disease being principally manifested in the muscular parts or instruments of motion, the symptoms are often more alarming than serious. The affusion of cold salt water, or rather its copious aspersion upon the naked body in the manner of a shower is here a remedy of great value.—The condition described may be considered as a condition already prepared for the application of the means stated. The system is susceptible, and the impression is of course strongly felt. The action consequent is such as gives energy to the circulation, warmth to the surface, force and consistency to the movements of life, thereby apparently rescuing the patient from the danger of imminent death. It is in this last condition only, perhaps, that the cold affusion has been found to be useful in the late stages of the continued fever of tropical climates. And, if useful in this case, we can easily understand how it should become so; for, as the action of the morbid cause here manifests itself upon the instruments of motion which are chiefly external, the remedy touches the subject at the proper point, consequently effects a change of circumstances at the sources of the derangement. The disease is here comparatively simple; but, as there is often complication or local congestions in the latter stages of the others, the general application of cold water cannot be expected to do good without preparation of condition; and, as this has been rarely, if ever applied to the case on just and scientific grounds, the cold affusion has only been a remedy of inferior value, or rather an application of uncertain benefit in such trials as have been made with it by the generality of practitioners. I have laid the position that where susceptibility is unimpaired, or rather where it is increased, the affusion of cold water on the surface may be so managed as to effect the most fortunate changes: it may also, where misapplied, increase danger or even occasion death; for, it is easily understood how the affusion of water of a low temperature, or the immersion of a person in the ticklish circumstances described into that which is very cold, may actually make such impression on the habit as to arrest the movements of life, instead of subverting merely the action of the disease. Aware of this chance of danger, I adopt aspersion myself, and I recommend it to others as a practice safer than affusion in the delicate circumstances alluded to: while I recommend, at the same time, that a glass of wine, or other more powerful cordial be given, previously to the application of the cold water externally; especially if the water be very cold, or if the patient be much exhausted.

The mode of treatment, which I have just now described, relates to the various aspect of symptoms which occasionally present themselves in the

Advanced periods of the second or irritated form.

advanced stages of a species of continued fever which occurs not uncommonly in the West Indies, which is of moderate violence at its commencement, and in which cold water may be affused on the surface at the early period, without artificial preparation of condition and with every expectation of benefit. I now proceed to notice the mode of treatment which is suitable in the latter stages of the more violent and concentrated. I have already observed that previous preparation is necessary, indeed ordinarily indispensable to the success of the cold affusion in the early stages of the violent or complicated form of fever; but I have also shewn that, if the plan of preparation be then laid with due consideration of circumstances and carried into full effect in execution, the power of the affusion is often, indeed generally, thereby rendered sufficient to arrest the disease completely, or to change and ameliorate its condition in so far as to deprive it of its dangers. But while this is true, I have also to remark that if the opportunity of acting decisively at this period has been neglected, or if the patient has not been presented to the physician till the febrile irritation, tumult and ardency have begun to subside, an occurrence which frequently takes place in thirty or thirty-six hours after the commencement of the disease, the frequency and force of the pulse then diminish, the stroke becomes soft, regular and slow, so as to resemble, when examined superficially, the pulse of a person in health, while, together with this, the pains of the head and eyes abate, or vanish almost entirely; in short, while the exterior condition often becomes such that persons, who are little acquainted with the history and character of the fevers of the West Indies, are disposed to consider the patient as commencing his stage of convalescence. He often indeed professes himself to be well; and, if we allow ourselves to judge his condition by the state of the pulse and superficial heat of the body, we cannot avoid assenting to his profession: but, though he be unwilling to acknowledge any feeling of complaint, at the same time that he is not insensible of his condition by reason of delirium, he often seems so restless and uneasy, from an unknown cause, that he cannot remain a moment in one place or posture. He rises up and lies down, and rises up again without apparent object, so as incessantly to change position. His acts are unaccountable; but the appearances of the disease are too often thought to be favourable, and even medical people permit themselves to be flattered by the presence of the fallacious symptoms which I now describe. The danger is notwithstanding great; and it is, in some degree, to be estimated by the absence of febrile irritation, or by a display of fidgetting and restlessness without assignable cause. The foundations of organic destruction are in fact now laid; and, unless they be speedily removed by the vigorous exertions of art, the work of destruction is so soon completed that the patient rarely survives the fifth day. The surface of the body, particularly the extremities, at the period of the disease now described, is not hot, scarcely even warm; the heat is notwithstanding still high,—it even appears ardent on the trunk, especially about the præcordia, or under the arm when these parts are strongly pressed by the hand. The skin seems thick and unelastic; it is dry and impervious to exhalation,—dusky for the most part; it even now begins to assume a hue of orange yellow, especially on the neck and at the angles of the mouth; while, together with the symptoms now mentioned, there is often more or less nausea, sometimes vomiting of a glairy ropy fluid, and often such an indescribable anguish at stomach as clearly indicates the commencement of internal disorganization.—The appearances noticed in this cursory manner characterize the second stage of the irritated form of the concentrated continued fever of hot climates, more especially as it is manifested upon athletic European subjects soon after they enter the tropical latitudes. Its course is short, and its more usual termination is by black vomiting with deep orange yellowness of the skin.

It is evident, from what has been said in the preceding parts of this work, that susceptibility of system, or the fit condition for the affusion of cold water on the surface is not present in the case described. If the fit condition be not present, the application of the remedy can do no good; if it does any thing, it may be supposed to do harm. Hence we infer that, as the condition required is not present, the first step to be made by the physician consists in creating it. This is effected primarily through changes which are produced in the circumstances of the great circulation; and these changes, we observe, are most obviously produced by the movements which arise in the act of subtracting blood. The subtraction of blood suddenly and in quantity creates a new condition in the circulating system. It accelerates circulation where sluggish or suffocated; it restores the suspended power of the absorbents, and even removes congestions in the vessels of the internal organs. Bleeding is therefore, even in this stage of the disease, an important remedy; but the proper management of it is difficult, such as requires a very careful circumspection at every step. The quantity to be taken away is not to be measured by a formal order in the prescription-book: it is in fact to be determined by the effect which arises as the blood flows from the arm; and this effect consists in the change which is induced upon the conditions of the pulse, viz. an increase of frequency, energy, and activity; in short, in the reproduction of febrile movement, more particularly as that is accompanied by the appearance of moisture on the skin, comprising an open and animated state of the surface; and finally restored absorption with signs of alacrity and activity through all the organic functions. When these conditions manifest themselves as an effect of bleeding, the circumstances so produced are favourable for the action of other means; and, circumstances being favourable, the suitable remedies then produce the desired effect. The means suited to this purpose are comprised in sprinkling the surface with cold water in imitation of showers of rain, even in a freer affusion of salt water cooled artificially, in washing the body with vinegar and salt, with lime or lemon juice, in gestation through the open air in a cart or carriage; and, as the foundations of congestion are apparently already laid in the organs of the abdominal system, particularly in the liver, in administering and frequently repeating strong purgatives, viz. calomel, to which may be added, extract of colocynth, jalap, or gamboge.

In the last stage of the form described, when black vomiting with all its train of horrors has made its appearance, the patient is usually considered as lost,--the case fatally decided. I confess that it would be dishonest to speak with confidence of the success of the powers of medicine in such a case; yet I think it would be highly culpable to abandon hope, or to cease from effort in the condition to which I now allude. There are some who now and then recover from this forlorn state by the unassisted powers of Nature alone, or accidentally through the aid of a remedy which chance presents. If we view the case as it actually stands, and endeavour to do any thing by a scientific rule, it is evident that the first step must be directed to the concerns of the abdominal system; for the force or effects of the disease are principally manifested in the abdominal organs. Hence the means of procuring evacuations by stool first engage our attention. We observe in our experience that effective evacuations often bring relief and apparently permanent benefit; and we observe farther, that of the kind of means employed to effect that purpose, calomel, jalap, gamboge,—such for instance as are small in bulk and active in operation, are the most suitable; they are followed however with advantage, in many cases, by dilution with solutions of the neutral salts. When a course of purging is properly conducted, the congestions in the abdominal organs, as may be reasonably supposed, are relieved ; and, when that is effected, we sometimes have the satisfaction of observing the living power gradually disentangle itself, so that health is restored, though by a slow course, to its pristine state. The vomitings, which are so characteristic of this form of disease, which are sometimes enormous in quantity, and which usually consist of matters vitiated in quality, are now and then restrained, at least temporarily, by swallowing large quantities of Cayenne pepper, by drinking pure lime juice, pure brandy, even spirits of wine and camphire, sometimes by taking large doses of white vitriol, alum, and, in some cases, sugar of lead. These however are only palliative and subsidiary ; the chief business turns upon the proper management of purgatives, aided by the judicious management of gestation in the open air in wheel-carriages.—The means, which I have thus mentioned, are rude remedies, administered in a rude manner. The case, it is to be remembered, is a forlorn one : the body is torpid externally,—almost as in death, so that no effect can be expected to arise from means which do not exceed in power and quantity the usual measures of regular practice.

Advanced stage of the gangrenous or putrescent.

The advanced, or latter stage of that form of the yellow fever which manifests the convulsively tumultuous, or torpidly suspensive process in its early period, terminates secondarily, or by direct effect in general gangrene or putrescence. I now assume the consideration of the case when the progress towards dissolution is become evident. The skin for instance is dry, dingy and dark as mahogany; or grey and dirty, sometimes livid generally,—nearly of the colour of a violet, or of a lurid green like that of a Spanish olive. The heat is not perceptibly increased; it is often lower than natural, particularly on the limbs and superficies of the body: the secretion of urine seems often to be suspended; the functions of exhalation and absorption are annulled; the blood exudes from the whole tract of the intestinal canal—from the lips downwards, sometimes from the nose, the angles of the eyes, and from the ears. In a case so desperate, the affusion of cold water on the surface cannot be supposed to be capable of doing much good, if it should be supposed to be capable of doing any good at all. The condition necessary for the favourable action of the remedy does not exist; and the means, which are placed within our reach for the purpose of creating it, are not such as are wholly equal to the end. When a vein is opened, the blood oozes rather than flows in a stream. The motion of the venous blood is thus evidently slow, almost suspended; and the course of fluids which circulate briskly in health is now in a manner stagnant. Here the subtraction of blood from a vein necessarily produces motion through the whole extent of the circle. This is a fact visibly submitted to our observation; and, as the animation of the sluggish or stagnant circulation is essential to the continuance of life, the subtraction of blood by the lancet, as effecting this purpose, may justly be regarded as a primary step in instituting a plan of cure. It is not indeed pretended that bleeding is an effectual or final remedy in the state of disease here described; yet, as its effects are manifested in the channels of the great circulation, and as the circulation moves the organic actions and apparently regulates the functions of life throughout the body, the subtraction here proposed may be considered as eminent among the means, which give commencement to a movement capable of being so conducted as to produce a basis through which the renewal of health may be eventually attained. The circumstances which I have noticed are formidable: they even appear to be desperate; but I cannot admit that they are entirely past hope. The signs of dissolution are here manifested in the circulating system generally, rather than in the organic structure of parts individually; and, on that account, I consider the case to be more manageable than if the destructive process were principally apparent in any one of the important internal organs. From this circumstance chiefly there arises an expectation, though by no means a confident one, that the course towards destruction and death may be sometimes arrested by the following process, conducted with discretion, but, at the same time, pursued with vigour. In the first place then let a vein be opened with a view to move the circulation of the sluggish or stagnant blood; and, when it appears evident that this effect has been in some degree attained, let the whole body be rubbed with a strong pickle of salt, nitre and vinegar, or with juice of limes or lemons. The poultice of yeast and oatmeal presents itself also for trial on this occasion; and, from its effect in arresting the progress of gangrene, we have grounds to expect that it will not be tried in vain. Together with these external applications, let grateful wines,—rhenish, champaign, even brandy, rum, spruce beer, cyder, or bottled porter be given internally,—the quantity measured by the expected effect. The effect, which I look for, consists in sluggish or suspended motions re-assuming their usual or an increased tone of activity. Such is the view: it may be farther aided by means which are more directly medicinal, viz. by large doses of zinc, camphire, alum, mineral acids, yeast, &c. The whole curative process is here connected in a chain,—preparative of condition or effective of salutary action; and the whole of the operation is promoted essentially by the act of moving the subject through the pure air in an open carriage, in sprinkling him with cold water frequently, and in changing the forms and presentations of the curative means occasionally, with the view of supporting the action of life forcibly till such time as the healthy train of action find its original base.—The practice which I have here recommended is practice for a desperate case. I have seen so much in my own experience as enables me to say that it is not visionary; but I do not know of any author to whom I can refer for illustration of its truth; I must therefore leave it to be tried and decided on by the judgment of those who have studied animal organization in its principles, and who have observed the laws of its movement with attention in various conditions of sickness.

The history of the endemic continued fever, the conditions of which I have now discriminated, in so far as respects the discovery of a rule capable of guiding us in the manner of applying cold water to the surface with a view to the cure of the disease, relates more directly to the endemic continued fever which belongs to the hotter regions of the earth, and which chiefly shews itself among European subjects soon after migration to a tropical climate, particularly to the West Indies.

Remark. The discriminations may probably be thought to be obscure or embarrassed, in the opinion of those who have not witnessed the progress of tropical fever by actual experience. I cannot even be confident that the distinctions and divisions which I have made in its history will be rightly apprehended by all those who have had the opportunity of actually seeing it. But, though there may be some who are not able to comprehend, and others who will not take the trouble to follow out the distinctions which I have made, I have reason to expect that those who have seen the disease, and who have carefully analysed its appearances, will not regard what I have said as fictitious, or consider the directions which I have given for the preparation of the subject and the management of the affusion of cold water at the different periods of the course, as dark and ambiguous; and while I say this with confidence, I trust with no less security that the practical rules which I have delivered, if fairly and fully executed by those who rightly conceive the principle upon which the whole effect depends, will not be found to fail in doing what I have promised. I therefore leave this part of the subject to the consideration of those who study the history of the disease at the bed-side of the sick, for such only can be supposed to understand it; and to those who take the trouble to witness all the steps of the curative process with their own eye, for such only are entitled to calculate success.

Epidemic character.

I have now drawn an outline of the different forms of fever, infectious or endemic, mild or concentrated, in so far as seems necessary for the discrimination of the different means which are best suited to prepare the condition of the subject for the affusion of cold water on the surface. In prosecuting this part of the work, I have chiefly kept in view the character of fever as it occurred in my own practice in military hospitals, in temperate or in tropical climates. As the acute diseases of the military are usually of a strong and well-marked character, rapid in course and formidable in danger, I have probably noted distinctions in this place which escape the observation of those who practise in civil life only, and I may seem to have adopted a boldness of proceeding in treatment, which subservience to established forms does not permit others to risk. Fever, though differing in degree and differing in mode of action in different cases, is fundamentally one disease; and whether it present itself in military or civil life, in a temperate or tropical climate, and whether it appear only sporadically or rage epidemically, the rule of preparing the subject for the application of a general remedy rests on a common base, as the action through which the cure is finally effected moves on the same principle, as soon as the subject is brought to the same level condition by previous preparation, varied and modified according to the circumstances of the case. This will not be denied: it may however be expected that I make some remark on the different manner of treating those fevers which appear as epidemic, and which sometimes rage with such violence and fatality as to obtain the name of pestilence. When fever rages epidemically, it often assumes the gangrenous form of action, differing however widely in degree of force and form according to the circumstances of the subject and conditions of the cause. Where the gangrenous form of action is present, the lancet is considered by most people to be an instrument of destruction; more however, I believe, from theory and prepossession than from observation and just reasoning: for it is true in fact, and it is consistent with the principle which appears to regulate movement in animal mechanism, that the sudden subtraction of blood from a vein should act by moving sluggish circulation into brisker motion; more especially where the vessels are surcharged and partially obstructed as is the case in approaching gangrene. If it do so, and the fact is a very obvious one, bleeding must be considered as a valuable remedy,—the first in order of time, and the highest in importance among those which are employed for laying the basis of cure in a disease which tends to stagnation or gangrene by a direct febrile act. It obviously accelerates the course which is disposed to stagnate. This is its visible effect, and it is a most important one; but it is not, on this account, pretended that bleeding is a sole or final remedy for the cure of a fever of a gangrenous character; for though it begin the process which prepares the susceptible condition, the presence of which is the criterion for successful action, it often leaves the effect incomplete without other auxiliary aid.

I have stated at length, perhaps tediously, the sum of what I had to say respecting the management of cold bathing when employed as a remedy for the cure of continued fever, whether infectious or endemic. I now proceed to notice, briefly, the manner of preparing the subject and of applying cold water to the surface in fevers of the periodic class; and I observe in the first place that the intermittent, or genuine ague and fever appears, by the testimony of different people, to have sometimes yielded to this remedy: on this head however I have nothing to add from my own experience, having rarely, scarcely ever indeed, submitted the subjects of the distinct intermittent to this experiment.

Intermittent.

But, though I have scarcely ever employed cold affusion in fevers of the genuinely intermitting type—such as are called ague and fever, I have on the contrary often employed it in the remittents of hot climates, even of temperate countries in the hotter seasons of the year where this form of disease is common; and, having done so, I can bear the most satisfactory testimony to its good effects. It is supposed to be understood, from what is said above, that the height of the paroxysm is the proper time for the application of the remedy. The sensations of heat are then strong; the headach is violent; delirium frequently runs high; all the forms of movement are fluctuating and changeable, the mode of action evidently differing from that close and concentrated mode of action, which, in many instances of continued fever, renders the system little sensible of impression, consequently which renders the effect abortive—without previous preparation of condition. In the remitting

Remittent.

form on the contrary, where the movements are fluctuating and changeable in themselves; or, where they have been rendered so by previous evacuation, the copious affusion of cold salt water on the surface brings an early solution of the paroxysm: sometimes it arrests the whole disease precipitately; at least it, for the most part, so ameliorates its aspect that, from obscure remittent, it appears at once an intermittent of a distinct and regular type. The effect, here stated, may follow in consequence of the application of cold water to the surface at any stage of the disease; it is however to be remembered that where there exist marks of irregular action, or, where there are indications of congestion in the abdominal system,— an occurrence by no means uncommon in the remitting fevers of hot climates, this powerful remedy, though it ordinarily gives relief, rarely effects a decisive cure without previous preparation of the fit condition, and frequently without the well-directed aid of other collateral means. Where signs of congestion, or irregular action present themselves in the abdominal, particularly in the biliary system, the case is not in itself a fit one for the application of this remedy. That the means may be effectual, a certain form of preparation must precede; and this, particularly where the disease is recent, is attained through evacuation, viz. purgatives, and emetics, rather than bleeding. Calomel with jalap, James's powder with calomel, or emetic tartar with purging salts, are generally the more suitable of the forms employed for effecting this purpose. The effect of these remedies, in removing temporary fulness from the biliary organs, is forwarded by that form of exercise which belongs to travelling in carts or carriages in the open air, under exposure to wind, or rain, or any change of weather. Where the case is recent, the means of preparation may be pushed vigorously; but, where structure is changed organically by the long continuance of irregular or diseased action in any one part, mercury by friction or otherwise, aided by the most abstemious and spare diet, constitutes the means upon which our reliance for preparing the fit condition must be principally placed. When the condition is prepared by removing local fulness or congestion, and by unfolding the complications incident to deranged structure, as the processes comprised in effecting these purposes are often such as highly increase the susceptibility of impression through the system generally, aspersion, made suddenly and freely by means of sponges, is then a more eligible mode of applying water than affusion in quantity by means of buckets; for, as the moving powers are now supposed to be equally balanced in consequence of artificial preparation, the mode proposed is sufficiently impressive to originate a new action, and not so strong as to give grounds to fear the chances that it may finally arrest the motions of life by its impulse, that is, occasion death.

The above is the outline of the general view, according to which I institute the preparation of subject, and direct the application of cold water to the surface for the cure of fevers of the remitting type: I have now only to add that the means, employed for the execution of the purpose, require to be varied occasionally so as to be adapted conditionally to the circumstances of the case. In cases where thirst is intolerable, and where the diseased action is manifested in the inner coats of the alimentary canal, rather than in the substance of more remote organs, very large draughts of cold water produce very surprising and sometimes very beneficial effects. If the thirst be completely satiated by the cold liquid, the paroxysm of the fever is sometimes instantly extinguished. But, though such effect may happen sometimes, the practice is not as yet reduced to regular rule; and, till that be done, it cannot be safely recommended for imitation. And further, where complication, or strong marked forms of irregular action exist, the effect of the affusion of cold water on the surface, or of an unusually large quantity of cold water drank suddenly, is precarious and uncertain, perhaps not always safe; for these, as I remarked before, are circumstances which oppose the extensive and beneficial effects of this remedy. It is even I think demonstrable that till complication be unfolded, irregular action repressed or diverted into the proper channels, there can be no just grounds to expect complete and final success from the application of means which act by impressing the system generally :—when the first is attained, the second is comparatively sure.

I have so far considered the remitting fever as submitted to cold affusion while in its remitting form. I have now to add that fevers of this type, particularly in tropical climates, sometimes, indeed not unfrequently lose their remitting form, change their character, and at a certain period of the course, frequently on the sixth or eighth day, appear entirely as a new disease. The distinction of paroxysm and remission is then lost or rendered so obscure as to be scarcely perceptible; and the symptoms, which had hitherto manifested themselves chiefly in the vascular or biliary system, are now principally conspicuous in the function of intellect, or in the instruments of locomotion. The leading symptom consists in one case in delirium of varied character; in the other, in fainting, or in disposition to faint in changing posture, occasionally accompanied with various appearances connected with excessive mobility or artificial weakness. In the first case, where there are no signs of actual inflammation accompanying the delirium, or no marks of effusion into the ventricles of the brain, the affusion of cold water on the bare head is strongly indicated. The water in this case is to be poured from a height—in a small stream, the affusion continued for a length of time, or till the desired effect be attained; in the other, the sudden aspersion, even ablution with cold water, particularly with cold salt water, is of eminent service; and it may here be applied with safety though the superficial heat be lower than it ordinarily is in health. The aspersion is now usually followed by an increase of warmth, even by vigour and firmness of action through the whole organic series; but, in order to assure the effect, even to render it safe and perfect, it is recommended that a glass of wine or other cordial be given previously to its application.

What has been now said relates chiefly to the remitting fever of hot countries, or of temperate countries in the hot seasons of the year. In the low, autumnal, remitting fever of temperate climates, in the form in which the disease ordinarily

Low autumnal bilious fever.

appears in low and wet situations, in damp and foggy weather, the benefits to be derived from the affusion of cold water on the surface are very uncertain; or rather the remedy is not admissible without previous preparation of subject, and without a particular form of modification in managing its application. The expression of the febrile action is not equally balanced and generally diffused in the case in question. Its greatest force is directed to the biliary system, the alimentary canal and its connections: hence cold water, as applied to the surface, does not touch the derangement at its source; consequently its impression cannot be expected to subvert the foundations, and thereby effect a radical cure of the disease. It is evident that, in the case alluded to, the first view of the physician, who undertakes the cure of this disorder, ought to be directed to the means of producing a condition of equal balance throughout; so that the action of the morbid cause being as it were equally diffused, the just susceptibility of impression being thereby restored, and if possible artificially augmented in the surface, the remedy may become adequate to the production of the effect required. The preparatory means, most suitable in the case stated, consist in immersing the body in a warm bath, the water of which is of rather a high temperature, in cleansing the skin from all impurities by scrubbing it with brushes armed with soap, by rubbing it dry with coarse towels and hot flannel cloths, the whole operations performed in the pure air of a warm apartment. By this enlivening influence of heat the condition is changed, and the case is prepared for the successful action of the cold affusion. A somewhat similar effect, as far as relates to the circumstances of the disease, follows the act of accumulating sick persons in confined apartments: it even follows the simple protraction of the diseased course; for the febrile motion has a tendency, in its own nature, to move towards the surface as preparatory of crisis. The conditions are again here changed; and, in consequence of this change of condition, a new form of action arises in the subject; which brings, in its train, the accompaniment of circumstances which replace the affusion of cold water on the surface in its just station as a remedy for the cure of fever.—Hence it must happen, as a consequence of what I have now stated, that cold affusion is a more effectual remedy in the latter periods than at the beginning of the course of the autumnal fever; a condition contrary to what occurs in most fevers of other forms.

The history of the slow, autumnal, bilious fever leads us naturally to the consideration of that form

Dysenteric. of febrile disease which is distinguished by dysenteric symptoms. The general affusion of cold water on the surface promises no good in this case: it cannot perhaps be employed with safety without previous preparation of condition,—such in fact as actually changes the entire face of the existing circumstances. The means of preparation employed for effecting this purpose are necessarily various according to the form in which the disease presents itself; but it does not belong to this subject to notice them at much length. There are for instance some conditions of dysenteric affection in which it is necessary to bleed, even to bleed to great extent; in most, it is necessary, or proper to immerse the patient in a warm bath,—the water of moderate temperature, the immersion continued long—for an hour and even longer. It is useful in almost all forms of the malady to rub the body, more particularly the abdomen with warm and stimulating oils; and, in many, particularly where the evacuations are mucous, whether scanty or copious, bloody or white, strong purges, viz. jalap with calomel, or purging salts with a portion of emetic tartar, afford great relief; in fact often cut the disease short abruptly, particularly if the purgative operation be followed by a full dose of Dover's powders, or some other anodyne, grateful and stimulating cordial which has a tendency to open the skin. When the dysenteric condition has been subverted by these and similar means, the application of very cold salt water to the abdomen, particularly to the lower parts of it by means of cloths or sponges; or, the immersion of the lower part of the trunk in a tub of water is singularly refreshing. It allays the torments of tenesmus where tenesmus exists; and it gives a respite from sufferings, which, if properly valued and improved, lays the case open to the action of general remedies, so that the disease may be conducted to a safe and speedy issue with something like calculable certainty.

Fever with local affection.

The fact is generally admitted by practitioners, and therefore does not require to be followed out with proofs or illustrations in this place, that the affusion of cold water on the surface is not an efficacious, perhaps not a safe remedy in fevers accompanied with inflammation or congestion in internal parts, whether head, heart, lungs, or liver; at least it is not safe or efficacious where inflammation constitutes the prominent symptom of disease. But, though not useful primarily, it is often useful secondarily in moving healthy action, or in maintaining it when moved, after the progress of the local action has been arrested by bleeding, or other suitable processes of medical treatment. Of the truth of this fact, I have proof in my own experience; but, while I state the fact, I have to remark at the same time that ablution or aspersion is better adapted to the purpose here in view than sudden and profuse affusion by means of buckets. No person, who duly considers the nature of animal economy, will, I believe, be disposed to employ the copious affusion of cold water on the surface of the febrile subject, whatever be the temperature of the skin, if symptoms of idiopathic internal inflammation actually exist at the time. This I think is an undeniable position; yet I must also remark that infectious fevers not unfrequently present themselves under the mask of phrenitis or pneumonia, and that paroxysms of the remitting type are often accompanied with transient forms of excitement, which, in superficial appearance, are not unlike real inflammation. These are excepted; for in neither of these is the application of cold water to the surface interdicted by my principle;—in both, in fact, it is found on trial to be safe and of great value.

Eruptive fevers.

The author of the Medical Reports, even several of his correspondents, appear to have had more experience of the benefits of the affusion of cold water on the surface, in fevers of the eruptive class, than has fallen within the circle of my observation. To these I must refer for fuller information, I shall however here notice the sum of what I have myself observed on the subject. 1. The practice of washing the body, partially or generally, ameliorated the condition of small pox when it was employed in the early stage, or under the eruptive fever. I have also witnessed great benefit from it in the hectic state which sometimes follows confluent small-pox of the worst character. This observation occurred to me in the West Indies, many years ago, that is, between 1774 and 1778: my experience however has not been very full on this head. 2. The affusion of cold water on the surface was not considered by me at any time as a warrantable practice in any form of measles; consequently no regular system of experiment was instituted on this subject. I may however observe that, as the affusion of cold water was a common practice in the first stages of febrile disease in the hospital at the Army Depot, during the time that I directed the medical department of that establishment, it was sometimes, though seldom, applied in measles by mistake, viz. before the signs of the disease had sufficiently declared themselves. I did not perceive distinctly that the practice was followed by injury; neither was I able to judge, from the very few trials thus made of it, that it was in any degree productive of good.

3. Ablution with cold water, with vinegar and water, or sponging the body all over with camphorated spirits, was employed commonly in a scarlet fever and sore throat which appeared at the Army Depot in the Isle of Wight in the year 1801; and which was one of the most malignant diseases that has probably been seen in Great Britain in recent times. The practice stated was marked with evident benefit; but the full and copious affusion of cold water on the head and shoulders by means of pails or buckets; a practice then commonly resorted to at that place for the cure of fevers of other forms, was not adopted in the present case. I considered the remedy as no more than an auxiliary for the cure of scarlet fever; consequently I did not employ it with the expectation of cutting short the course of the disease abruptly. I do not maintain but that bolder means, or a bolder use of the same means might have done more than was here done by the form of ablution to which I have alluded: I was however uncertain of the effect, and I could not prevail upon myself to risk the trial of copious affusion under the idea of cutting short the course of the disease abruptly—in the manner which that application is known to cut short the course of a common infectious fever. I doubted whether it was practicable, or if practicable whether it was

safe and desirable to arrest the course, and precipitately to extinguish the expression of a disease of a specific product. As I was embarrassed by this doubt, I contented myself with moderating violence and diminishing danger by the means stated, leaving the disease to attain its own termination through its own specific process. I think however that I may add with safety that affusion will rarely be serviceable in this disease with gangrenous ulcerations—without other important aid.

Recapitulation of practice.

I have now detailed at length the conditions of subject and circumstances of fever, in which the affusion of cold water upon the surface has appeared to be useful, of no value, or injurious. I might perhaps leave the matter as it stands; but, as the subject is much diffused, and more diversified by illustration than would have been necessary had not my principle and the results as manifested in practice been controverted, and, as it would seem in the opinion of some, overturned by the doctrines and experience of the author of the Medical Reports, I conclude the reader will be gratified, and some I hope may be benefited by seeing the sum of my practical rules compressed into narrow compass, and at the same time contrasted fairly and in few words with those of the author alluded to.—I observe then in the first place that in the milder forms of fever, whether infectious —such as is usually called typhus, or endemic —such as arises from the action of common causes in a diffused form, Dr Currie's practice and mine in regard to cold affusion are precisely the same. This remedy, as has been fully shewn, is employed in the earlier stages of fever by both of us; and it is employed by me, as well as by Dr Currie, without previous preparation of condition; for, as susceptibility of impression, the condition on which remedies act, is ordinarily present in the mild and open form of fever in its beginning, preparation would be superfluous, and, if ill-directed, it might be hurtful. This is the fact as to the actual practice of Dr Currie and myself. I must however remark that the author of the Medical Reports is principally guided in the application of cold affusion by the presence of increased heat, the existence and quantity of which he measures studiously by means of the thermometer. I, on the contrary, am guided by the evidences of a susceptible condition of the system connected with a simple condition of disease; while I judge the presence of heat simply by the sensation communicated to my hand in touching the body. I cannot, I confess, so accurately measure degree or quantity by means of my hand, as Dr Currie does by means of a thermometer; but I am enabled by means of the touch to estimate the distribution and form of diffusion; and, together with these, that particular balance of movement in the living system, which marks susceptibility of impression and capacity of manifesting effective action with the application of a suitable power of stimulation. This knowledge is important; it arises in the examination which I institute,—it is not attained by the help of a thermometer merely.

2. The author of the Medical Reports, who employs the affusion of cold water in the mild and open forms of fever without preparation,—and who then employs it with success, employs it likewise, —and without preparation, in those which are violent, concentrated and complicated, if temperature, as measured by the thermometer, be higher than the natural standard; or, he abstains from the application, if it be low, or but moderately increased. The absence, or depression of external heat is not a rare occurrence in the history of fever; and if heat be deficient, the remedy which forms the subject of this work is interdicted according to the precept of the author of the Medical Reports, from whatever source the deficiency may arise: hence the practitioner, who confides in this precept, is left at *fault*,—uncertain which way to turn. From this difficulty I endeavour to extricate him; and I have reason to think that I have done it with

safety and effect. In prosecution of my purpose I endeavour to simplify the disease, that is, to reduce it to one level condition. If this be done correctly, it will appear evident to any one who at all considers the movements which belong to animal economy, that the affusion of cold water on the surface resumes its place, so as to be rendered capable of producing effects similar to those which it produced in the case first described. But that my meaning may be rightly understood, I shall note the principal circumstances which interdict the use of this remedy according to the precept of the Medical Reports; state the conditions which oppose its salutary effect where the application is sanctioned generally by the authority of that work; and finally add the outline of preparation through which complications are to be simplified; in so far that the disease being reduced to this common level may be equally open on all points and subject to be acted upon effectively by means applied generally.

1. In the first place, where the heat of the febrile subject is low or deficient in degree, the affusion of cold water on the surface is not deemed admissible according to Dr Currie's precept; and, if not admissible as Nature presents the case, no form of preparation is suggested by that author through means of which it may be rendered so. I have here ventured a step farther, and I think I

have done so with safety and with success. But that this point be rendered clear, I shall endeavour to give an illustration of it by example. In the first place, then, I suppose a case presented where the febrile heat is deficient in degree, or where it is unequally distributed in the surface; but where no primary mark of local inflammation, or congestion in any one of the internal organs is discernible. In this case, I conduct the patient into an apartment where the air is of a high temperature, I apply warm fomentations to the extremities, I purify the skin by friction with brushes, soap, and warm water, I affuse warm water on the surface generally, or I immerse the whole body into a warm bath. It is evident that equal distribution of heat and superficial circulation cannot fail to be promoted by the operation of the means stated. Susceptibility of impression is restored, even artificially increased by friction with soaped brushes and warm water: the condition favourable for the action of remedies is prepared; and, the condition being prepared, the affusion of the cold water acts with power: it ordinarily produces great effect,—frequently a decisive arrest of the erroneous course, and finally a complete cure of the disease. This mode of preparing the subject, which most persons will admit to be a safe one, is often necessary where the character of fever, particularly infectious fever, is masked by the operation of causes which belong to situation of place, or circumstances peculiar to the patient, viz. the inelastic air of damp cellars, jails, barracks imperfectly ventilated, or crowded transport-ships, damp and foggy weather, constitutional indolence, artificial confinement and restraint. A condition of subject, somewhat similar to that described, presents itself in the endemic or bilious autumnal fever which prevails in cold and raw seasons, in confined camps, particularly where the service is irksome, and the spirits of the individual are depressed. In this case the favourable condition for the action of the cold affusion does not exist. It may however be created by employing similar means as those already described; and, when that is done, the effect of the affusion is equally successful as in the preceding.—The condition, which I have now stated, presents the first essential difference which exists in the practice of the author of the Medical Reports and that which I recommend. The reader will, of course, follow his own opinion. I do not attempt to influence his election farther than to suggest to him that the condition which I thus prepare is calculated to give success to the application of cold water to the surface, even on the supposition that cold water produces its salutary effect by acting on increased heat; for the heat is increased superficially; and it is more equally diffused in the extreme parts in consequence of the practices described, than it is found to be as the disease presents itself in the natural form.

2. The author of the Medical Reports, as I mentioned just now, entertains no idea of preparing condition previously to the application of cold water to the surface in any case of fever. If increased heat be indicated by the thermometer, the affusion is ordered without hesitation, unless in the case of profuse perspiration, and perhaps idiopathic inflammation of internal organs. The effect I may venture to say will not always be decisive; in many cases, the remedy will not do any thing, and, in some, its action will not be salutary. It is well known that increased heat may exist in a febrile subject, and in fact often does exist conjoined with defective susceptibility; in so much that remedies of ordinary stimulating power, and among these affusion of cold water on the surface, make no decided or permanent impression. The more obvious of the conditions, which mark suspended susceptibility, are sometimes connected with a certain form of constrictive action manifested in the system generally, sometimes with action of a tumultuous and precipitous course in the organs of circulation, and sometimes with local congestions or inflammation in internal parts. In the condition which I deno-

minate constrictive, the heat of the body is rarely high, though higher on many occasions than the natural standard; if higher, the application of cold water to the surface is sanctioned by authority. In the case of the precipitous and rapid course, it is often strong, ardent, and intense:—its existence constitutes the cold affusion the great and sovereign remedy. In the case of internal inflammation, it is higher or lower according to the system of parts affected and the character which the action assumes,—suppurative or gangrenous; but it is generally above the natural standard: it thus presents the condition where the trial of the cold affusion is supposed to be safe and useful. If the heat be high—be other conditions what they may, idiopathic inflammation perhaps excepted, the principle of the author of the Medical Reports sanctions the application of cold water to the surface; nay, his precept expressly enjoins it, if the heat, as measured by a thermometer applied under the tongue or at the axilla, be higher than natural. The higher the increase, the greater are his hopes of success. I may however remark that the impression of this remedy, as I have had the opportunity of witnessing in the course of my public service, has not always an effective operation, at least a beneficial one even where the heat is high. In the constrictive, as well as in the precipitous forms of action which fevers often assume, the affusion of cold water without previous preparation of condition is only a remedy of insignificant power, at most of temporary effect. In the local forms, where there is internal congestion or inflammation, it does not, and could not be reasonably expected to do good: there is even reason to apprehend that it may often do harm. The conditions then which I have mentioned are not favourable for the effect of cold affusion without preparation. The author of the Medical Reports, as already observed, admits of no preparatory process; he even expresses himself hostilely against the practices of evacuation which I employ with that view. In assuming his rule of practice, I think I may be allowed to say that he has not drawn it from a view of fevers in their violent forms; otherwise, he could not have avoided seeing its insufficiency. In the conditions noticed above, and in which this author institutes no form of preparation, I endeavour to simplify the disease where it is of a complicated character. I thus attempt to moderate the precipitancy of its course where it is inordinate, or to animate the action where it is languid and stagnant; with the view that a certain level condition or juster balance being reproduced, the affusion of cold water may resume its place; in short, that the remedy may be then followed, as it is in fact often followed, by effects fortunate and decisive as when it is applied under forms of disease which are naturally simple and mild. The violent and rapid action is arrested or moderated by general bleeding: the stagnating and sluggish circulation is often animated by the same means, especially as assisted by friction of the surface and the fomentations of a warm bath: the local forms are also moved by bleeding, more especially by evacuations made as near as possible to the seat of the affection.—The means here stated are to be adapted with measured calculation to the circumstances of the case and subject, and they are to be carried to that point in execution which ensures the object for which they are directed.

3. And lastly, as the author of the Medical Reports admits of no form of preparation in the early stage of fever, so he does not seem to consider the propriety or necessity of it at its advanced periods. But, as it is obvious that fever is then often deeply complicated as an effect of the long continuance of diseased action; and, as it is demonstrative that the affusion of cold water on the surface acts effectually only on a simple disease, the cold affusion is consequently now uncertain and precarious in its effect—not unfrequently unsafe. Increased heat is not always, perhaps not

generally present in a high degree in the advanced periods of fever. If the increased heat be not present, the affusion of cold water is said not to be proper; consequently the opportunities of employing the remedy occur but rarely according to the precept of the Medical Reports. The view which I have given of the subject is evidently directed by a principle which presents a wider range of action. Instead of taking the disease as I find it, applying the remedy, or withholding its application in correspondence with the presence or absence of a fluctuating symptom, I endeavour, at whatever period it may be presented to me, to form the case, that is, to create the condition; and, having created the condition, I apply the means with confident expectation of success. If complication be simplified, local congestion removed by bleeding or other evacuation, equal distribution of heat and circulation promoted by fomentations, frictions, bathing and other suitable means, the susceptible condition may then be supposed to be restored; and this being done, and the fund of life not being exhausted by the effect of what has been done, the affusion of cold water on the surface, measured carefully in quantity and adjusted in manner relatively according to the circumstances of the case, may be expected to produce an operation fortunate upon the whole, but probably not so decisive as if it had been applied at the commencement of the disease, when the course was less firmly established, and where a bolder use of the same means might be admitted without risk of danger. Where torpor exists in any material degree, whether the power of susceptibility be engrossed by a general, rapid and strong action, suspended by action of a peculiar, but obscure mode, or diverted as it were into an insulated channel locally, thereby consituting local oppression, the affusion of cold water upon the surface fails of effect,—principally from want of power of impression to arrest and control a vigorous general action, or from not being applied to parts which communicate directly with the seat of the error. It is evident, in such cases, by what rule and to what point the preparation ought to be principally directed. But, while cold affusion is ineffectual in one case—from want of power, where there is an opposing torpor from whatever source it may arise; so it is also to be remembered that it may be dangerous in another from too great power, in as much as it is applied with force and in quantity where susceptibility is preternaturally increased; a condition, which arises frequently in consequence of excessive evacuation, inanition and exhaustion from preceding exertion. Here a glass of wine or other cordial, instead of evacuation by the lancet or by purgatives, is often safe, useful and necessary previously to the application of the remedy in question: Hence the relative conditions, viz. the susceptibility of the subject and the power of the agent, are to be carefully studied so that they may be adjusted to each other with exactness; for, as a small power produces little or no impression where there is fulness and strong existing action; so, where there is inanition with weakened power of re-action and susceptibility excessively increased, the application of a strong agent, which produces arrest of motion by first impression, may even arrest it so decidedly as to preclude the customary movements of life.

Upon the whole then we conclude that, if the presence of increased heat be the condition which sanctions the affusion of cold water on the surface of the febrile subject, and if the measure of heat by the thermometer be the rule which determines the physician in his judgment in the application of the remedy, the rule of practice is a precise one. But admitting this, and granting all necessary precision in the application of the means, we must still confess that the rule is limited; for, even on the supposition that the presence of increased heat is in all cases a faithful guide for the employment of cold affusion, its absence an unvarying rule of interdiction, there are many conditions of fever in which increased heat does not appear at all; consequently there are many conditions of fever for which the benefits of cold affusion cannot be obtained, consistently with the principle assumed by Dr Currie;—hence the assumption of *his* principle reduces the application of the remedy to a circumscribed sphere. On the other hand, if the view of febrile action suggested in this work be just, the cold affusion is capable, by preparation of the subject, of being made a remedy of almost all conditions; for it is supposed to act upon one consistent base which exists as long as life exists, though it is sometimes hidden or masked by the presentation of objects which the preparation alluded to is calculated to remove. The patient, for instance, is supposed to present himself under the circumstance of increased heat or without it, even with heat of diminished quantity,—with symptoms of one regular form and character, or with symptoms variously complicated and combined, even seemingly opposite to each other in their nature. The fit condition for the affusion of cold water is present, or it is not present in the case presented. When not present, the first object among the physician's operations consists in preparing it, viz. in simplifying complication, in creating a condition favourable for the action of a remedy of general effect; the second, in applying the remedy, in the condition thus prepared, with force and in quantity corresponding with the circumstances of the case. The sphere of the remedy is extended by means of the preparation stated: the obstacles to its just action are removed; and the effects are rendered nearly alike certain in all, in as much, as all are brought nearly to a level point of susceptibility, in consequence of the effect of the preparation here suggested. The practical views are thus different according to the principle of the Medical Reports and that of this Exposition; for it is plain that, if increased heat be the condition, and if the thermometer be the guide to ascertain the fit condition, the application of the remedy calls for little exercise of judgment, and scarcely admits the chance of being employed in error. On the contrary, if susceptibility of impression generally, precise knowledge of condition internally, and estimate of power of action relatively, be circumstances necessary to be known before we venture to promise success from our practice, the rule which influences the application of the remedy is not of easy apprehension. It cannot be measured by an artificial instrument; and it is not in fact attainable without extensive and just views of animal economy generally, as well as a close attention to the circumstances of the individual case presented. But, if difficult of attainment, it gives, when attained, a systematic form to our proceedings, a wide range to our art, and great precision to our operations. —Such is a contrasted view of Dr Currie's practice and my own on this important subject. Which is the view most likely to be adopted by the medical world, I do not take upon me to determine; but such is the facility of the one, as resting on an obvious symptom; and such the difficulty of the other, as requiring minute attention and accurate discrimination of a variety of ambiguous conditions, that I form no very sanguine expectation in the number of my followers. The medical practitioner requires a routine supported by authority which exempts him from the task of thinking. He is rarely disposed to prosecute a principle which lays open a practice, the correct execution of which must depend upon his own individual judgment, responsibility for the effect of which must consequently rest on his own head.

Investigation of principle.

I have thus detailed the rules which I observe in employing cold bathing as a remedy for the cure of fever, and I have likewise contrasted them with those adopted by the author of the Medical Reports. The practice seems now to have attracted a considerable share of public attention; and, as the subject is unquestionably important in itself, I shall not perhaps be thought to have executed my duty properly, unless I endeavour to investigate the principle through which the fortunate effect is attained. If we assume opinion from the contingence of loose appearances, and present such opinion as a general principle supposed to rest on the solid base of universal fact and sound reason; while it is in reality circumscribed in its sphere, or delusive in its nature as claiming success from circumstances of accidental combination, our labours profit not;—the chances are that they may be hurtful. Cold bathing, affusion, ablution or aspersion with cold water, which is now praised as a remedy for the cure of fever, comes to be viewed in this light. It is powerful; but it will only be salutary where it is properly applied; and there can be no security for applying it properly without a knowledge of the principle through which it acts. This, as it appears to me, is not yet clearly explained; it therefore will not be deemed superfluous that I enter into the investigation of it at some length.

Opinions of the ancients.

I have already remarked that some notice of a partial or limited use of cold applications to the body of the febrile subject is found in the works ascribed to Hippocrates, but that the first full and fair experiment of the affusion was made in the time of Augustus Cæsar, in the person of the Emperor himself. The application of cold to the surface, and the use of cold water internally present themselves as practices naturally resulting from the Hippocratic theory of fever, the essence or base of which is supposed to consist in preternatural heat. As preternatural heat is the base of his theory, the radical rule of his practice, which affects to cure diseases by opposites, (εναντια εναντιως), reverts obviously to the application of cold as a remedy. But, that the reader may form his own opinion on this subject from specific evidence, I shall transcribe from his works a paragraph which relates to Hippocrates. the treatment of the disease termed Καυσος. "*When* Καυσος *exists, the fever is continual, the thirst vehement, the tongue rough and dry, even blackened by the heat of the breath: with this, the skin is yellow, the expectoration bilious, the body is cool or cold on the surface and extremities,—it retains a strong heat internally. Here cold, applied to the abdomen, and even exteriorly to the surface, produces marked benefit;—it must however be applied with such caution as not to induce shivering: and, together with the external application of cold, it is further useful to give drinks and gruels frequently—in small quantity and cold as possible, and to attend to the concerns of the bowels; hence, if the evacuations be not effective, it is proper to give glysters, and to moderate the heat, either daily or every third day, by injections* *of the highest attainable degree of cold**." Such is the practice of Hippocrates. It appears to have originated in principle, at least it is connected with a train of reasoning and regulated by a form of reasoning in its application throughout. We cannot so clearly discover the operation of systematic principle, or the deductions of reasoning in the experiment made by Antonius Musa in the person of the Emperor Augustus; an experiment, which stands on record as the first instance of the practice of affusing cold water on the surface of the febrile subject with a view to the cure of the disease. It is mentioned by the historian Suetonius, "*that Augustus, harassed by severe and dangerous indispositions through the whole of his life, but particularly after the subjugation of Cantabria, was reduced to the extremity of despair by catarrhal defluxions, accompanied with a diseased liver. In this condition he submitted, through a kind of necessity, to a hazardous and contrary me-*

Antonius Musa.

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* Καυσος δε ὅταν εχῃ, πυρετος ισχει, και διψα ισχυρα, και ἡ γλωσσα τρηχειη και μελαινα γινεται, του πνευματος ὕπογε θερμοτητης, και το χρωμα ὕποχολον γινεται, και τα πτυαλα χολωδεα. και τα μεν εξω, ψυχρος γινεται, τα δέσω λιαν θερμος. Τουτῳ ξυμφερει ψυγματα προσφερειν, και προς την κοιλιην και εξωθεν προς το σωμα, φυλασσομενος μη φριξῃ, και τα τε πωματα και τα ροφηματα διδοναι πυκνα, κατ᾽ ολιγον ως ψοχροτατα, την δε κοιλιην θεραπευειν, κην μεν μη ὕποχωρεῃ τα ενεοντα κλυσαι, ψυχειν τε κλυσμασι ὥς ψυχρυτατοισιν η ὅσημεραι, η δια τριτης. Hipp. Opera, p. 518, edit. Fæsian.

thod of treatment to that which had been employed; for, as he was not benefited by the effects of the discipline practised in the warm bath, he now, at the instigation of Antonius Musa, committed himself to an experiment of an opposite nature, viz. the affusion of cold water on the surface[*]." The experiment would appear, from this account, to have been made at random, for it was undertaken under the failure of the usual practice. It might thus be deemed rash; for we see no other base or ground for trial except the failure, or error of a past act. It was however fortunate: the life of the Emperor was thought to be saved by it; and, we are informed by another historian, that "*the success of the practice, which consisted in the application of cold water to the surface joined with its internal use, obtained great reward for the physician, both from the Emperor and Senate; immunities and honours for himself and his professional brethren, both in the time being and in that to come*[†]." But this practice, though fortunate in

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[*] Graves et periculosas valetudines per omnem vitam aliquot expertus est, præcipue Cantabria domita, cum etiam destillationibus jecinore vitiato, ad desperationem redactus, contrarium et ancipitem rationem medendi necessario subiit; quia calida fomenta non proderant, frigidis curari coactus auctore Antonio Musa. *Sueton. Octav. August. cap.* lxxxi.

[†] Ψυχρολουσιαις και ψυχροποσιαις ανεσωσε, και δια τουτο, και χρηματα παρα του Αυγουστου και παρα της βουλης, πολλα, και το χρυσιοις

Celsus.

the *debut*, failed soon afterwards in the case of Marcellus. Hence it does not appear to have remained long in fashion at Rome; for Celsus, who most probably lived in the reign of Tiberius, did not employ it to greater extent in the ardent fever than was done by Hippocrates. He however adds a remark in the chapter on the cure of slow fever which is highly deserving of notice, not only on account of the knowledge of the fact, but on account of the view through which he appears to explain it. His words are to this effect: "*The body of the patient is therefore to be sponged and rubbed with cold water mixed with oil; for it sometimes happens that a shivering, which may be considered as constituting the beginning of a form of new movement, follows from this treatment; and hence it is that, when the heat of the body is raised artificially to a high point, remission is naturally expected to ensue as a consequence: and further, frictions with oil and salt appear also to be beneficial in the case stated*[*]." The mode of

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δακτυλοις χρησθαι, την τε ατελειαν και ἑαυτω, και τοις ὁμοτεχνοις, ουχ ὁτι τοις τοτε ουσιν, αλλα και τοις επειτα εσομενοις, ελαβεν.

Dio. Cass. tom. i. p. 723, edit. Reimar.

[*] Sæpe igitur ex aqua frigida cui oleum sit adjectum, corpus ejus pertractandum est, quoniam interdum sic evenit, ut horror oriatur, et fiat initium quoddam novi motus; exque eo, cum

practice here noticed is recommended by Celsus only in slow fever. As such, the sphere of the remedy being limited, the power of the cold affusion is not estimated at its just value. The explanation of the effect I however consider to be important; at least it corresponds very nearly with the idea which I hold on the subject; viz. that the application of cold water to the surface is capable of producing a new movement in animal and organic action,—such as often coincides with, or passes into the action which belongs to health. If the application of cold water to the surface of the febrile subject actually excite a new form of action, we must suppose it to be capable of occasionally increasing, not merely of diminishing, the sensible heat; for the expression of animal heat is formed and modified by a certain character impressed on organic action as that exists naturally, or as it is produced artificially in the living system by forcible means. I cannot be certain that Celsus meant by the term, *novus motus*, a new train of action such as that I ascribe to the effect of cold water applied to the surface of a person ill of fever; but, be that as it may, the fact is admitted by both; and it is evident that the admission of it extends the sphere

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magis corpus incaluit, sequatur etiam remissio. In his frictio quoque ex oleo et sale salutaris videtur.

Celsus, de Curatione Febr. Lentar. lib. iii. *cap.* 9.

of the remedy to wider limits than the doctrine assumed by Hippocrates, Galen, or the author of the Medical Reports. For, if the power of cold affusion be estimated according to the doctrine of these writers, it can only be supposed to moderate excess, or to restore the just balance by subtraction: on the contrary, if estimated according to Celsus, or the opinion which I hold, it subverts erroneous action and restores one that is just and regular, through a change effected in organic movement; the figure of which reproduces the temperature of health, whether that may have been previously in error by excess or by defect.

Charmis.

After the time of Celsus, I do not know how long, "*Charmis, an adventurer from Marseilles, suddenly seized on medical opinion at Rome. He controverted, not only the practice of the physicians of former times, but he condemned the discipline and utility of warm baths, and introduced the custom of cold bathing into the capital, even in the intensity of winter cold. He immersed his patients in ponds; and old men of consular dignity were now seen shivering from the effects—by way of boast* *." We do not know to what forms of disease this practice was applied; for, if Charmis ever wrote upon the subject, his writings have not descended to the present times: it is however more than probable that fever stood at the head of his catalogue.

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* Hii regebant fata (scilicet Thessalus et Crenas) cum repente civitatem Charmis ex eadem Massilia invasit, damnatis non solum prioribus medicis, verum et balneis: frigidoque e-

Galen, who reasoned plausibly on most subjects, and who acted boldly and decisively as a physician on many, appears to have adopted the practice of cold bathing as a remedy for the cure of fever on specious grounds. He applied it to his subject with studied consideration to the circumstances of the case; and he conducted the management of it, in all its parts, with an elegance and luxury of manner which it has not yet attained in this country, and which, from radical difference in national character, it probably never will attain. The application of cold water externally and the free use of cold drink internally present themselves, by direct consequence, as remedies for the cure of fever according to the Galenic theory; which, as is commonly known, is held to consist in the presence of preternatural heat. This theory is exhibited in detail in various parts of that

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tiam hibernis algoribus lavari persuasit. Mersit ægros in lacus. Videbamus senes consulares usque in ostentationem rigentes. *Plin. Hist. Nat, lib.* xxix. *cap. 5.*

author's voluminous works, but I shall content myself with transcribing one passage only, viz. "*The deranged temperature of the febrile subject consists in excess of heat; consequently the direct means, through which the just temperature is to be restored consist in the application of cold. Hence, if fever be already formed; and, if the cause which occasioned it yet remain in force, refrigeration becomes exclusively the point in view with those who attempt its cure. In pursuing this purpose, we are therefore led to seek for those means of remedy which possess a refrigerating power sufficient to oppose and counterbalance that of the augmented heat* *." This doctrine, whether well or ill founded I do not at present inquire, leads directly to the application of cold externally as a remedy for the cure of fever, the cause or essence of which is supposed to consist in excess of heat. The refrigerating power, or remedy calculated for this case is most obviously and easily found in cold water; which, applied externally and received into the stomach internally, must be

Galen,

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* Εστι δ' ἡ αμετρια της πυρεττοντων δυσκρασιας, εν πλεονεξια θερμοτητος.—ἡ τοινυν, εις ευκρασιαν, ὁδος αυτὸις δια ψυξεως εσται. ει μεν ουν ηδη γεγονοτες ειεν ὁι πυρετοι, το δε ποιησαν αυτους αιτιον σχοιτο, μονως αν ὁυτος ειη της θεραπειας αυτων σκοπος, ἡ ψυξις. ὥστε ζητητεον ἡμιν τας ὑλας, ὁσαι ψυξιν ισορῥοπον εχουσι τη πλεονεκτουση θερμοτητι. Galen. Oper. tom. iv. lib. viii. p. 118. Edit. Basil.

regarded as means directly corrective of a temperature preternaturally increased. As preternatural heat is thus supposed, according to the doctrine of Galen, to constitute the essence or cause of fever; so the affusion of cold water on the surface, or immersion in the cold bath naturally presents itself as the most obvious and direct of remedies. If the theory were just, the practical inference would be undeniable,—and the proceeding would be sure; but the result of Galen's experience, though certainly favourable compared with that of others, is not sufficient to establish this theoretical position. Galen, it must be confessed, had high success, by means of cold bathing; but it is probable that he owed much of his success to the discipline practised in the bath,—viz. the frictions and the alternations of hot and cold affusions or immersions, which prepared a condition and perfected an effect in a manner which he did not rightly understand,—a manner certainly different from simple subtraction of heat. As this method of treating febrile diseases by means of hot and cold bathing was grateful and singularly successful, it was in high fashion at Rome in Galen's time; and it was probably known and practised wherever Roman civilization, or more properly Roman luxury, extended.

The doctrines of the Greek physicians were propagated widely in the East in consequence of war or other communication with that country. Galen was esteemed above others; in fact so much esteemed that his doctrines became the oriental medical creed at the time: and it may even be inferred, from what is found accidentally in the relations of travellers, that the spirit of his practice still holds its place in those districts of Asia and Africa which were once classical and learned *. But, as the doctrines of the Greeks spread widely in the East, and still adhere to these regions; so we find that the opinion, which holds the presence of preternatural heat to be the essence of febrile disease, was taught in the medical schools in the West after the revival of learning in Europe: it does not however appear that the practice of cold bathing, though presenting itself by a direct and natural inference from the theoretical doctrine alluded to, was then brought into use. If it was ever tried by accident, we are not correctly informed of the effect; nor do I know in what manner the effect was attempted to be explained by those who had accidentally witnessed the trial. It is probable that the event, when fortunate, was imputed to impression through the application of a new and un-

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* Chardin, Bruce, Busbeck.

usual medium, that is, an impression of surprise exciting a new movement throughout the whole organic system. In this light, it struck myself as it was brought under my notice by the relation of Captain Cunningham referred to in the first part of this work. The subjects of Cunningham's history were soldiers, who were sent on board of ship from the camp at Havannah as unfit for duty on account of sickness. Many of them threw themselves into the sea, and some of them were drowned: those who were rescued from the waves, as far as he was capable of judging, were generally benefited in their health by the immersion. The number, who attempted the experiment, I conclude to have been considerable; for Cunningham regarded them as persons bewitched, the recollection of whose fate still impressed him with a superstitious dread. I am also disposed to believe, from the tenor of the relation, that the disease was frequently far advanced in progress when this inclination discovered itself; for the mortality among those on board made little impression on his sensibility, comparatively with the desire manifested by the sick to precipitate themselves into the sea. This desire shews itself not unfrequently in the latter periods of fever in tropical climates; for, there is then sometimes such deception in vision, or such derangement in intellect that no argument which

Author's first opinion.

can be employed, without experiment of the fact, is capable of convincing the patient that the sea, through which he is sailing, is not a field or meadow clothed with verdure. When this is the case, the violence and danger of the disease, also the excess of febrile heat, as far as my experience goes, are usually diminished or past. If this be so, and if, under this condition, the subject be restored to his senses by immersion into cold water, he may be supposed to be brought back to his powers of recollection and probably to perfect health, by strong impression made on the sentient system through a new medium rather than by subtraction of preternatural heat; for there is no certain evidence that heat is always preternaturally increased in the person thus immersed. Some such idea, concerning the manner through which the effect stated was produced, arose in my mind at the time I was made acquainted with the history to which I have alluded. The idea, thus obtained, was somewhat confirmed by what I saw soon afterwards in the instance of a negro child, who was revived by repeated aspersion with cold water, and apparently maintained in life for several hours by this means where no excess of heat existed. It seemed also to be supported by facts which I witnessed in the course of a few months, viz. that the application of cold water to the surface brought a favourable solution of a febrile paroxysm in one case, where heat and force of action were much higher than natural; while it gave firmness, strength and consistency to all the actions of life in another, where no increase of heat was manifest, nay where excess of mobility and apparent weakness were extreme. From these facts, which presented themselves to my observation at an early period of my experience with this remedy, I considered the affusion of cold water on the surface as a power which makes a strong and general impression on the system, and which arrests the course of the disease or changes its condition in virtue of that impression,—not in virtue of subtracting increased heat.

Principle twofold.

Such is a summary view of the supposed operation of the affusion of cold water on the surface of the febrile subject. It is twofold; either as relating to subtraction of increased heat, which is held to be the cause which constitutes fever, or which supports it in its course; or, to a new form of action produced as a consequence of a new and forcible impression made upon a subject naturally susceptible, or rendered so artificially by particular forms of treatment. I shall consider the first at some length, as it is the opinion in which the public confides. If well founded, it brings the treatment of fever to a point of great simplicity, even to a kind of mathematical precision: if not well founded, it will be a source of frequent disappointment, and it may even occasionally lead to danger: it therefore deserves a careful investigation in all its parts.

Subtraction of heat.

I am aware that the assumption of a doctrine, authorising the use of a remedy which is calculated to act upon the temperature of the febrile subject, which is capable of reducing its excess, and which is supposed to be capable, in consequence of such reduction, of destroying a link of the febrile chain, and of thereby cutting short the course of the disease, carries with it a face of great plausibility; and I am also aware that, while the view is plausible and the object apparently precise, the means employed for attaining it often accidentally meet with such condition of system, particularly in the slighter forms of disease as gives success to the act; and thus gives at first sight an appearance of consistency to an effect, which I consider, and which I believe I shall be able to prove to be only contingent. The presence of increased heat is supposed, according to this doctrine, to be the condition which sanctions the application of cold water to the surface; and, as sensation is sometimes fallacious, the thermometer is employed to measure the presence of that increase. This instrument is accordingly supposed to be necessary for giving the test of the just condition which warrants the application of the remedy, as it not only ascertains the presence of the heat, but as it measures its quantity with precision. For, as the excess of heat is held to be the cause which gives duration to the disease; so the thermometer, as an instrument of a precise scale, measures degree and prevents our sensations from leading us into error. From the application of this instrument to measure temperature, we are supposed to attain an exact knowledge of the means of cure; and I do not deny that, if the condition favourable for the affusion of cold water on the surface actually depend on the existence of preternatural heat, and if the degree or quantity of heat be ascertained by the scale of a thermometer, the rule of practice, while simple in apprehension, must also be supposed to be easy in execution; for it is regulated and adjusted by a sure guide. I even further admit that, if it were proved, that increase or excess of heat exist as the inseparable condition of every fever, that the reduction of that excess also invariably reduces or extinguishes the fever, and that the thermometer, which expresses on its scale the quantity of the heat of the animal body, also express such character in organic movement as indicates precisely the condition which is warrant for the salutary action of the affusion of cold water on the surface, the assumption of the principle, and the adjustment of the rule for executing the practice by the guidance of an instrument, not liable to vary like the sensitive power of an individual, deserve to be viewed as one of the most precise and valuable discoveries which has ever been offered to the medical world. But this is not the case. It is known to almost every one that the existence of increased or preternatural heat, as measured by the hand of the healthy physician, or as indicated by the scale of a thermometer, is not manifest in every stage or condition of febrile disease. In some it is scarcely discernible in any stage or condition; and it cannot be said to be always correctly balanced with the force or intensity of the febrile cause, at least with the dangers to which the action of that cause exposes organic life. In many instances which terminate favourably, the heat rises to 108° of Fahrenheit's thermometer, probably even higher; in others, which terminate fatally, it perhaps never, at any period of the course or in any condition of the disease, reaches 99°. It frequently subsides, returns to its natural standard, and even falls below it where the disease is making regular progress to a fatal termination: it rises high, becomes diffused and expanded where it is tending towards a salutary crisis. If this be so, and nothing is better ascertained in the history of diseases, we cannot fail to conclude that the presence of increased heat is no more than an adventitious circumstance in fever, viz. one of the expressions of the disturbed action which arises from the impression of a febrile cause, not the point or condition on which the existence of the disease depends; consequently not to be considered as a basis on which to found a general plan of cure. It is a position which no one will pretend to question that the cure of a disease, in order to be successfully conducted, must be directed by a condition which is constantly present; the removal or extinction of which removes or extinguishes the malady in all its forms. This position, which is a fact, shews us plainly that subtraction of heat is not an extensive and a sure base on which to institute a plan for the cure of fever; for it is not always present. And, as the action of a febrile cause is sometimes present without the obvious expression of a preternaturally increased heat; so the increased heat, when existing naturally, may be actually extinguished artificially by the affusion of cold water on the surface without comprising, in such effect, the certain solution of the disease. If this fact be correct, and I rest it on the authority of communications which are admitted to be authentic by the author of the Medical Reports [*], the act of subtraction considered as the base on which the cure rests, for it implies that the solution of the disease follows the reduction of the increased temperature, cannot be held to be well placed. It is not uniformly true according to obvious appearance, and the supposition that the disease goes on by morbid association after the cause is removed,—the auxiliary by which this anomaly is attempted to be explained, can only be regarded as an assumption :—it is perfectly gratuitous, and not even warranted by analogy.

We thus see that the presence of increased heat is not essential to the action of a febrile cause [†]; and we also see that the artificial subtraction of it, when existing in excess, does not necessarily and absolutely command the cure of the disease. When we view this fact, and admit the undeniable position that the fundamental law of action impressed upon organized matter is simple and one in its nature, uniform and consistent in its mode radically, the fabric in the Medical Reports, raised on the principle of subtracting febrile heat with a view to the cure of the disease, vanishes entirely. The base upon which the organic action of the animal system moves is, as I observed before, simple and uniformly consistent wtih itself; but the forms of the effect are liable to be masked or disguised; and sometimes they are so involved and covered by contingent appearances as to seem, when viewed superficially, to be various, fluctuating, and contradictory. We are struck with what is most obvious, pleased with what is most various and specious: hence it happens, and we can easily conceive how it should happen that, if cold water affused upon the surface of a person in a hot fever should obviously absorb or dissipate the heat, and if, with this dissipation or absorption of heat, it should at the same time arrest the course of the disease; the absorption or subtraction here implied being the visible effect, and one ostensibly connected with the means employed, might naturally enough present itself to the observer as the immediate cause which subverted the diseased course and dissevered all the febrile connections. The effect is a visible one: the conclusion is specious and plausible; and, if no exception to the rule existed, though the truth of it might not be demonstrated, we should be encouraged to believe in its probability. The probability is however rendered questionable by the number of anomalies which present themselves in the history of fever: I may even add, that the possibility of it is disproved by the acknowledged simplicity and consistency which obtain in all Nature's fundamental operations; and the existence of it is refuted by the fact that excess of febrile heat may cease of its own accord in the natural course of the disease, or that it may be extinguished precipitately by the power of artificial means without implying the necessary extinction of fever as a consequence. This is a positive fact; and, with this point of fact in view, we are unavoidably forced to conclude that preternatural or increased heat is only adventitious in fever, viz. one of the contingent expressions of the action of the febrile cause, not the identical cause itself which supports the disease, not even an indispensable link in the chain of the febrile derangement; consequently not the point which necessarily attracts the eye and guides the physician who meditates its dissolution.

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[*] Medical Reports, vol. ii. p. 97.

[†] Ibid. vol. i. p. 238, 239.

If this doctrine, viz. that increased temperature is the cause which maintains fever in its course, that the reduction of temperature, by the application of cold water to the surface, is the cause which dissolves its connections and thus cuts short its career, should still be thought to be tenable, notwithstanding what has been now said to the contrary, I believe the question will be finally put to rest by the statement of a fact which is well ascertained by my own experience, and which I must conclude has not escaped the notice of others; viz. that, as the action of a febrile cause may actually exist without an open expression of increased heat, so a disease of this deficient temperature may be cut short abruptly by affusion, ablution, or aspersion with cold water,—for the most part safely, and often decisively where no increase of temperature is perceivable, as well as where it rises to a high point as judged by sensation, or as measured by a thermometer. If this be true, and the proofs of its truth are neither few nor equivocal if I be allowed to speak from my own experience, the affusion of cold water on the surface cannot be supposed to extinguish fever by subtracting preternatural heat, or even by acting on sensation through its medium ; for heat does not exist in the case adduced, and yet the effect of the remedy is often salutary, even sometimes effective of abrupt cure *.

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* Instances, in which the affusion of cold water, particularly cold salt water was salutary without the presence of increased heat, abound in my own experience ; and the case of De Hahn, mentioned at page 85 of the first volume of the Medical Reports, shews that ablution with cold water is not injurious even where the surface is covered with a cold sweat. The case of Dr Pinckard also, to which I have already alluded, proves that cold affusion may be refreshing, gratifying, and invigorating, where external heat is not conspicuous, and where weakness is extreme.

The historical facts which I have now mentioned, and which are so common that they cannot well be supposed to have escaped the observation of medical practitioners, compel us to abandon this popular doctrine. If what I have stated be true, we must endeavour to discover some other quality in the cold water which is affused upon the surface besides its power of acting on increased heat, of subtracting that increase, and of arresting the febrile course in virtue of the action of cold abstractedly. Till we fix the base on which this remedy acts, we must be supposed to employ it with uncertainty and occasionally with risk; I shall therefore endeavour to illustrate the subject by some farther evidences; and, in doing this, I shall adduce facts which occur frequently in practice, and which cannot be supposed to be unknown to medical men of even moderate experience.—In the first place it is not rare for persons, who are under the influence of the action of a febrile cause, to present a train of symptoms of a highly irritated character; among which tumultuous circulation, great heat of the skin, violent and perhaps outrageous delirium, are conspicuous. Here the affusion of cold water, particularly copious affusion on the head and shoulders, calms the delirium, reduces the increased heat, moderates the tumult of the circulation, and apparently restores all the actions to the regular and just movement which obtains in health. Here there is evidence of increased temperature; and it might perhaps be contended that the change described is effected through the medium of subtracted heat. This ground, so plausible in the case stated, vanishes entirely when we consider what occurs in this which follows. A febrile subject, for instance, is presented to us in a state of low delirium, muttering and talking incoherently: the circulation, instead of being rapid and tumultuous, is languid and diminished; the pulse frequent, small, soft and compressible: the heat moderate, not perceptibly increased, probably lower than natural, but at the same time equally diffused according to its degree. Here affusion, ablution, or aspersion with cold water, particularly with cold salt water, produces an evident effect—and frequently a salutary one. It represses the muttering delirium, diminishes the frequency of the pulse, increases the force and energy of the circulation, and, what is remarkable, raises the sensible heat—sometimes to its just standard. This history, and it is a real one not of rare occurrence, proves decidedly that the application of the cold water to the surface acts by a principle different from that of subtracting increased heat. This opinion, which may be thought to be well supported by what has been now adduced, receives illustration and farther proof in a review of conditions which occasionally present themselves where fevers fluctuate and vary in their forms, particularly at late periods of the disease. We thus observe that a febrile patient sometimes lies supine in bed—without consciousness, or without power to express his consciousness, without power of speech, even almost without power of swallowing, without power to restrain the urinary and fecal discharges to their customary habit, and without increase, nay probably with a considerable diminution of heat. In persons of this description, the affusion, or rather the aspersion of cold water, particularly of cold salt water adjusted in circumstances of application according to the relative conditions of the subject, is often followed by a return of consciousness, by a recovery of the powers of speech and swallowing, by command over the sphincter muscles, by signs of general animation and by increase of sensible heat, even in the extreme parts. There is no evidence, indeed there is no ground of probability to suppose that the powers of speech and swallowing are here suspended by the presence of increased heat, or that they are restored by its reduction; for increase does not exist perceptibly in the subject of the experiment: on the contrary, it even appears that, where the heat is lower than natural, it is actually augmented, perhaps raised to a just standard by the application of the means stated; which, according to the doctrine of subtraction, might be supposed to reduce it still farther, even to extinguish it altogether. This fact, which is not equivocal, proves very plainly that the affusion of cold water does not act upon the adventitious circumstance of increased heat by a direct and simple reduction of its excess; and, thus acting, thereby dissolve the febrile association, that is, arrest the course of the disease as a consequence of that reduction. Increase of heat does not, as has been already shewn, always exist under febrile action; and therefore, if not existing, it cannot be subtracted: even where it does exist, the repression, or simple subtraction of it by the means stated does not afford a satisfactory explanation of the fact here observed. It is evident that the simple subtraction which acts upon excess, while that excess is to be considered as an accumulating effect, can only be temporary. The heat returns, unless the source which gives it out in this undue quantity be corrected; and, if the heat return, the cure or arrest of the diseased course is not perfect or permanent. This is a legitimate deduction from the premises; yet we know by experience that the cure is frequently perfect and permanent; and we know moreover that a salutary and decisive change is often produced by the means in question where no perceivable increase of heat exists, even where it is lower than the natural standard; consequently where no effect is, or can be produced through the medium of subtraction.

The arguments hitherto adduced, respecting the insufficiency of the doctrine of subtracting increased heat, relate expressly to the conditions of the febrile subject; there are others illustrative of the action of affusion of cold water on the surface, which may be drawn from conditions which have no connection with fever, and which manifest no signs of increased or preternatural heat in any of their circumstances. It is known for instance to almost every body that where the surface is cool or cold, the animation apparently suspended as in fainting, the act of sprinkling the surface suddenly with cold water tends more directly, and more effectually than almost any other application whatever to recall the suspended animation, to restore the insensible subject to consciousness, and to reproduce the natural expression of heat through the whole extent of the ice-cold frame. The occurrence of this fact is common; and, while the fact is common, it is at the same time obvious that the effect here noticed cannot be considered as in any manner connected with subtraction of increased heat; for it is evident that no increase of heat exists in the case: on the contrary, heat is for the most part sensibly diminished. This history then must be deemed satisfactory in proof that affusion, or aspersion of cold water on the surface, is capable of moving a new and salutary action in the system without acting on heat as a subject matter: and it is further deserving of remark that where the extremities are cold, even benumbed to insensibility from exposure to cold, the affusion of cold water, or washing the benumbed parts with water, with ice, or with snow, restores the animation, and, at the same time, brings back the heat and circulation more speedily and more happily than any other power within the command of our art. There is here demonstrative proof that affusion of cold water, the application of ice or snow, produce salutary effects through some other medium than the simple subtraction of increased heat; for they act powerfully and salutarily where no increase of heat is perceivable. Upon the whole then we are warranted to conclude, by direct inference from the historical facts here detailed, that the extinction of fever does not follow as a consequence of the reduction of heat effected through the impression of the simple power of cold abstractedly; but rather that the application of this dense and cold medium makes an impression on the susceptibility of the organic system, in consequence of which a new form of action arises,—such, for instance, as is analogous with that of health, or identically the same; and we further observe that this reduction of heat, or regulation of temperature does not precede the reproduction of the action of health: —it follows it expressly as its just and corresponding effect.

The principle, through which cold water produces its operation when affused upon the surface, I hold to be one and the same in all cases, however it may be inveloped and disguised by accidental contingencies in the individual condition of the person upon whom the affusion is made. It thus either refers itself to the reduction of increased heat primarily; or it refers itself to a new form of action, the consequence of impression made on a susceptible subject, independently of temperature. In the first, the application of the remedy is limited by the presence of increased heat, consequently it is of a narrow sphere; in the second, it is regulated by susceptibility of impression generally, a condition which is connected with the expression of life through the whole organic system. If we act on this last view, the remedy may be rendered as extensive in its application as the circle of febrile disease; and while the sphere of the remedy becomes thus extended, the explanation of the effect every where preserves consistency. This is the view on which I pretend to act: the first I consider to be the view which directs the practice of the author of the Medical Reports. This author every where insists on the presence of increased heat as essential to his operations, and he founds his expectations of success on the subtraction of that excess *. He notwithstanding adds explanations on various occasions as if he believed in the latter opinion. They seem however to be interpolations; and they embarrass the subject so much that I cannot be confident that I now represent his real meaning. I am however confident that no one, who considers the subject with attention, will assent to the consistency and correctness of explanations which sometimes turn on subtraction of increased heat, and sometimes on sudden impression made on the sensations; for we know that sensation may be impressed whether the heat be preternaturally increased or not, and we conclude that if the sensation be capable of being so impressed, and if action be the consequence of that impression, the presence of increased temperature is not the basis which is essential or indispensable to the

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* Medical Reports, vol. i. p. 68. 241, to 263.; vol. ii. p. 233, to 248. and various other places.

salutary effect of cold affusion. I am however ready to allow that it is often favourable; for it is often connected with that diffused and equal condition of susceptibility on which the remedy more immediately acts, and acts salutarily; but while I admit this, I also maintain that the base of the principle through which the effect is produced is one and the same in all cases; the primary operation, like all the primary operations within the circle of Nature's works, being always simple and consistent with itself.

Thermometrical observation.

If the presence of increased heat be not an inseparable and indispensable condition of febrile action, the simple reduction of heat is not the point upon which the solution of the disease indispensably depends; consequently we infer that, to effect such reduction merely, is not the point to which the application of remedies is to be principally directed. If this be admitted, it may be held to be a superfluous labour to lead the reader through a long detail of fact and argument concerning the value of thermometrical observations. These only are important, in so far as they ensure systematic precision in the application of cold water to the surface of the febrile subject; but, from what has been already said, it may be presumed that they do not present themselves as applicable to all cases.

I might therefore pass over the consideration of the subject altogether without injury to the interests of the sick, or the instruction of the physician; but, as the thermometer guides the practice of the author of the Medical Reports, and as that author commands public opinion at present on the subject of cold affusion for the cure of fever, I cannot, consistently with the duty of the task which I have undertaken, avoid noticing it in a full and particular manner; for, whether its informations be deceptive where they are held to be true; or futile where they are deemed to be important, I hold myself bound to shew that they are so by producing the ground and proof of my opinion.

The thermometer, as applied to the body of the febrile subject, indicates relatively the degree or quantity of the existing heat: it conveys no idea concerning the quality or nature of its movement, —a condition especially connected with susceptibility of impression or its defect; and thus held to be a safe guide for directing the physician in the application of remedies. In this manner, while the thermometer measures degree, it conveys no idea concerning order of movement, whether strong, ardent, uniform and steady in form of expression, deep seated, or concentrated in the interior; or whether light, fluctuating, superficial and expanding. The distinction of such conditions is notwithstanding important. The first is connected with that form of disease which requires a strong power of remedy, perhaps a combination of powers of opposite natures to prepare the subject and impress the system; the second is generally connected with such a mobile condition of habit that a simple power, producing a forcible impression, arrests the diseased course, and often implies in its consequences the eventual recovery of health. If this be a true state of the case, it is evident that the information respecting condition derived through means of the thermometer is not complete; for, though the actual degree of heat may stand at the same, or nearly at the same point in both, the affusion of cold water of the same temperature and in the same quantity is followed by very different effects; viz. in the latter by signal relief, if not by perfect cure; in the former, by injury, by no benefit, or by temporary refreshment only. This distinction, which is so important and which does not influence the thermometer, impresses itself upon the hand of the physician; and, so impressed, it serves as a guide to direct his judgment in applying and modifying the application of the remedy. On this ground it is recommended to the physician, who examines a febrile patient with a view to the affusion of cold water as means of cure, to place his hand upon the forehead, upon the trunk,—the chest and epigastric region, the upper and lower extremities, to touch the surface lightly and to press it strongly; for, he will thereby be enabled to judge the character of the heat,—not only the quantity, but the order or balance in movement, which is intimately connected with susceptibility of system upon which powers act and through which remedies produce their salutary effects. When the physician institutes his examination according to the view stated, he does not consider quantity and force merely; he also takes condition or order of movement into contemplation, noting whether it be constant and of one tenor, or whether it move rapidly as if by explosion; whether it seem to advance progressively to the surface or to withdraw from the surface as if to accumulate in the interior; and finally, whether or not it be accompanied with a peculiar, but not easily defined expression which marks increasing or declining susceptibility of impression to external objects.

Besides the cases now described, which present themselves at the early stages of fever, there are others where the conclusions drawn from the indications of this instrument are equally ambiguous, if not more so. It is known to persons, who are acquainted with the history of fever, that the skin loses its lively susceptibility of impression at a certain period in the progress of the ardent and concentrated form of disease which sometimes appears in tropical climates, and which is usually denominated yellow fever. Congestions or accumulations then take place internally in the great veins or principal organs of the trunk: the heat subsides on the extremities, on the exterior and open surface of the body; it probably still continues ardent and strong on the chest, and at those parts to which a thermometrical instrument is usually applied. The skin is here dry, thick and condensed: the sensation, communicated to the hand of a healthy person who examines it, is peculiar in its kind, indicating that the tide of circulation retires to the interior, and that the susceptibility of impression in the surface, with the power of manifesting re-action, is materially impaired. In this case, in correspondence with the rule now stated, no indication arises in sensation by the touch of the subject that the application of cold water to the surface is calculated to produce an immediate salutary effect; yet the thermometer, placed at the axilla or under the tongue, would probably shew a high degree of heat in the parts to which it is applied; and, in doing so, it would, according to the author of the Medical Reports, sanction the application of cold water to the surface, while experience proves decidedly that it is of no benefit, The above conditions occur frequently in the history of febrile diseases, particularly in hot climates; but, besides these, there are others where the degree of febrile heat, rising high, or falling low as measured by the scale of a thermometer, furnishes no safe or decisive information for employing or for withholding the remedy in question. The measure of heat, as indicated by the thermometer applied under the tongue or at the axilla, does not always rise high in fevers accompanied with internal congestion or with inflammation of internal parts: it however generally rises higher than natural. If the thermometer be considered in this case as the exclusive test, which is to guide our judgment in the application of cold water externally, we shall certainly be led into error. The rise on the scale of the instrument sanctions the application of the remedy: experience proves it to be useless; we cannot perhaps say that experience proves it to be uniformly safe. But further, if the rise marked on the scale of the thermometer be permitted to determine our judgment exclusively with regard to the employment of cold water externally for the cure of fever, the remedy will sometimes be sanctioned where, as we have already observed, it is not useful; so it will be sometimes interdicted where, as we shall now shew, it is of the highest value. In certain fevers or conditions of fever, particularly in warm climates, the action of the disease, especially in its latter course, is principally manifested upon the functions of the muscular or moving powers. Excess of mobility, fainting or disposition to faint with change of posture, tremors, startings and other modes of fluctuating action chiefly strike the eye: the skin is sometimes moist, sometimes dry: the pulse is frequent, small and changeable in condition: the heat, as judged by the hand of a healthy person, and I presume, though I never made experiment in the case, as measured by the thermometer, does not exceed the natural standard;—it does not perhaps reach it. There is here in fact no indication of increased heat; yet experience furnishes satisfactory proof that ablution or aspersion with cold water, particularly with cold salt water, produces effects of the most salutary kind. It raises the heat to the natural standard, if depressed below it; it diminishes the frequency of pulse; it increases its strength and vigour; it checks or removes excessive mobility: hence tremors, startings and disposition to faint cease as a natural consequence of the change induced. The changes thus brought about are fortunate; and the remedy, though interdicted by the precept of the Medical Reports, is safe in its effects and at the same time effective of great good. But while

I thus speak of its safety and effect and recommend its application as now stated, I must, at the same time, impress upon the attention of the reader that no marks of congestion are supposed to exist in the internal organs in the case to which I allude. The respiration is calm and easy; the eye is clear; the countenance serene; the skin soft and open; in short, appearances indicate evidently that action, though weak and ticklish, is equally balanced and generally expanded in the extreme parts. In this condition, the habit is readily susceptible of impression, and the application of cold water made to a surface thus susceptible, if measured and adjusted with consideration to the existing circumstances, is followed by a form of action regular and consistent in its kind, or analogous with that which obtains in health.—The form of disease to which I now advert is not a rare one in tropical climates. It was common in Jamaica between the years 1774 and 1778 in the district where I resided, viz. at Savanna la Mar, and among the people with whom I was most connected, viz. British soldiers and European sailors.

If the distinction of conditions stated above be real, the cases of illustration adduced correct in point of fact, the inference is conclusive that thermometrical observation, as applied to regulate the affusion of cold water on the surface of the febrile subject, is not an improvement of the first practical value: on the contrary, it is such as may lead the practitioner occasionally into error. Impressed then by the results of what I have seen, I consider the thermometer when employed to measure the degree of heat of the febrile subject, as an instrument somewhat similar in its uses to the stop-watch employed for the purpose of measuring the number of arterial pulsations in a given time. The act of measurement is imposing in appearance. It exhibits the ostensible grounds of an operation which may be supposed to lead to accurate calculation: the advantages however appear to me to be deceptive, rather than real. This opinion implies no paradox; for, it is not only probable, but true if I may be permitted to form opinion from what has happened to myself, that the attention, as fixed on measuring the mere degree of heat, or in counting the mere number of the pulse, is proportionally abstracted from the consideration of other points which are more important. I do not therefore consider it to be necessary, perhaps not useful that the physician, who is on the spot, should fix his chief attention upon the informations of a thermometer or a stop-watch; for, as I have just now said, such attention is likely to abstract him from the observation of matters of more importance than themselves. But, while I maintain this opinion, I am willing to admit that a knowledge of the degree of heat and of the number of arterial pulsations, in a given time, is a point of information by no means to be rejected in the record of a case, communicated for the opinion of a person who has not the means of satisfying himself of the particular circumstances by means of his own senses. The thermometer and stop-watch establish fixed points in the history of fever to which the whole chain of symptoms has more or less relation: It therefore may be employed subordinately to enlighten the view; but I again repeat that, where the physician can appeal to the testimony of his own senses, the information drawn from that source, while sufficiently accurate for practical purposes, is less deceptious than that connected with mere knowledge of degree or number. To this I may add that the knowledge of the mere number of arterial pulsations in a given time, though not to be overlooked by the physician, is of less importance in directing opinion than almost any other of the conditions which relate to pulse, —such as strength and energy, regularity and cadence, expansion and freedom; or the opposites; —all which are learned by the touch of the hand without the help of a stop-watch. This point is clear, and it is also true that while knowledge of the degree, at which the febrile heat stands on the scale of the thermometer, is a consideration of some value in most cases, it is generally a less important one for the institution of a rule of practice, than that which is obtained through sensation communicated to the hand of a healthy person in the various examinations to which the febrile subject may be submitted. From this he may learn the order and law of movement, the balance of action or distribution of active power throughout the system;—and these are points of principal importance to be studied by the practical physician.

It is known to every body that there is great latitude in the number of the febrile pulse in a given time as measured by a stop-watch, and in the quantity of the febrile heat as noted on the scale of a thermometer. This is so vast, that it is difficult to say how far a correct opinion can be formed of the condition of disease, or effect of remedy by the mere consideration of number or quantity; for persons frequently recover from fever where the pulse has been numbered at 150 in a minute or even higher, and they sometimes die where it has never risen so high as 90: and again, many survive where the heat, as measured by the thermometer, rises to 110° of Fahrenheit, even higher, or die where it never reaches 99°, perhaps where it can scarcely be said to exceed the natural standard. This proves to demonstration that the mere number of pulses in a given time as measured by the stop-watch, or the mere quantity of heat as marked on the scale of the thermometer, are not matters of the most important consideration in the history of fever, not even the most important which belong to the heat and pulse of a febrile subject: and further, while the measure of degree and the calculation of number indicate only very loosely those conditions which are connected with danger, safety or effective power of action in the system, they probably sometimes lead to inferences that are deceptive and contingently injurious. We thus observe that the academical physician, eager to exhibit his professional operations with all their formalities, measures the number of pulses in a given time with the utmost care by means of his stop-watch; and, enlightened by information obtained through this means, he calculates effect and forms opinion with much apparent confidence on the bare report of number. This, though in fact one of the least important of the circumstances which belong to pulse, forms the chief object in his view; and, if principally trusted to for affording means of information, it most probably leads him to draw an erroneous inference and to adopt an injurious practice. In a similar manner, the thermometrical physician, who measures the degree of febrile heat with exactness and minute precision by means of an instrument, fixing quantity in his eye as the leading circumstance of his consideration, is apt to overlook other conditions or qualities connected with heat which are more essential to accurate knowledge. The condition in fact resides in an estimate of the balance and force of active power throughout the system: a knowledge of it imparts a juster view of the nature of disease, than a knowledge of measure of degree of heat, or velocity of pulse merely: it is attained through the medium of sensation; and hence sensation furnishes a surer indication of the success or failure of remedies than what is obtained through the medium of the stop-watch or thermometer.

The above are some of the circumstances which relate to the subject of thermometers as employed to ascertain the conditions which sanction or which interdict the use, and which regulate the application of cold water to the surface as a remedy for the cure of fever. If we form our opinion solely by the information which this instrument supplies, there is reason to believe that we shall be sometimes led to do what is wrong, frequently to abstain from doing what is right. The scale of the instrument does not indicate those more important collateral conditions connected with the movements of heat, which have a more intimate affinity perhaps with the action of remedies than the mere measure of degree. It does not in fact possess advantage in any point over the hand of the physician who is supposed to be a person in health; and, as such, is supposed to possess, in his own sensations, a natural thermometer or balance of the just or healthy temperature of the animal body. The excess or defect of temperature is thus measured by sensation,—not it is admitted so precisely in as far as respects quantity, as by the thermometer, but at the same time with sufficient precision for every useful practical purpose. It may thus be inferred, from what I have already said; and it is proved by the testimony of some of the principal authorities noticed in the Medical Reports that all requisite practical precision, for the application of cold water to the surface, may be attained without the thermometer *. Mr Nagle had not one, and Dr Gomez † did not think it necessary to make use of one; and yet the success of the practice of both these persons was brilliant.

I may seem to have extended this part of the subject unnecessarily; for it does not, on its own account, require such detail of refutation: but, as belief in the value of thermometrical observation possesses the public mind at present, I hold it to be

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* Medical Reports, vol. ii. p. 136.

† Ibid. vol. ii. p. 158.

right to warn the practitioner, and to convince him, if I can, not to place confidence in that in which there is no trust. I think I am warranted in making the assertion that the thermometer is not a guide, upon which we safely can rely for regulating the affusion of cold water on the surface of the febrile subject. But while I speak in this manner, it may perhaps be objected that I speak without evidence; for I fairly confess that I never made trial of it during the time I resided in the West Indies. I always indeed considered the heat of a febrile patient with great attention as far as I could do this by means of my own senses; but it did not occur to me to measure it by means of an instrument till I met with Dr Currie's publication at the close of the year 1798. As the value of this improvement was rated high by its author, I made trial of it posterior to that date, in the expectation that I should thereby attain greater precision in applying cold water in febrile diseases, than I had as yet attained: I did not however persevere in this course for any length of time; for I soon found that the sensation communicated to my hand, in the various examinations to which the patient might be submitted, was a surer guide for directing my judgment than any I could obtain through means of the artificial instrument.—I discontinued the practice, and I have now stated my reasons for so doing.

Recapitulation of reasons, and elucidation of principle through which the cold affusion is supposed to act.

Having considered the practical application of cold water to the surface of the febrile subject at some length, and having discriminated the circumstances which ought to regulate its use with considerable care, I shall now endeavour to give a general view of the principle by which the practice is directed, in so far at least as I can do it with safety. If the points of fact stated in the preceding pages be well established, that is, if a febrile action be capable of existing without the expression of increased heat, the increased heat either not appearing sensibly, or after it has once appeared declining in degree, viz. ceasing to be sensible by the operation of some unknown cause, or by the application of obvious artificial means, without necessarily implying the extinction of the disease, we shall not, I may venture to say, be warranted to consider the expression of heat as a fundamental base of febrile action, that is, as a condition on which the continuance of the disease essentially depends; consequently, we shall not be allowed to regard its subtraction as the view which ought to guide the physician when he proceeds to arrange his plan of cure. This is evident; and to this I add that the physician, who has had the opportunity of observing the history and progress of fevers in different climates, and who has studied their movements systematically in all their forms, mild or aggravated, must have now and then seen fevers, particularly in tropical countries, in which the natural heat was diminished, or as it were suppressed during the time of the paroxysm, and in which it evolved, or was restored again to its natural standard at the usual period of the paroxysm's termination. If he has witnessed this phenomenon, or if he admit the truth of the fact, he will not, I conceive, be obstinate to maintain that increased temperature is the condition which supports febrile action, or that reduction of temperature abstractedly is the condition through which the affusion of cold water on the surface acts, when it arrests the febrile course. The position seems demonstrative; but it is contrary to the doctrine of the author of the Medical Reports, whose reasonings I cannot help remarking, are extremely embarrassed on this head. The condition which he assumes as the base on which the cold water is supposed to act, I hold to be subtraction of increased heat. This is his ground; he notwithstanding often introduces allusion to impression on sensation, which renders his doctrine fluctuating and inconsistent with itself.—If the base change or fluctuate, the superstructure cannot be stable nor can the effect be sure or calculable.

Systematic writers, who think themselves obliged to explain every thing which occurs within the circle of the animal body according to fundamental rules and primary reasons, seem, in treating the subject of fever, to refer its proximate cause, either to some unknown and imaginary principle which has no visible foundation in fact; or to one or other of those contingent, though more prominent symptoms which manifest themselves in the progress of its course; which exist indeed, but which are only parts in the circle of a general operation, and which are by no means certain in their order, or equal in their force relatively to each other, so as to be regarded as cause and effect, even to be indispensable to the existence of the disease. The first class give out visionary theories; and, as the opinion which is formed concerning the proximate cause influences the management of a cure, the plan of cure is formed upon an uncertain base. The latter give out partial theories, and plans of cure; though successful sometimes, only so by accident, and at best only palliative and temporary. Medical history furnishes ample proof of this; and, thus instructed by the errors or failures of those who have gone before me, I shall not attempt to explain the intimate processes through which the Author of our being moves, maintains and modifies the action of life, in health and under disease. This lies beyond the reach of comprehension. The action which we do not comprehend cannot be supposed to furnish a stable basis for our proceedings; nor can our course be deemed safe, though it may seem to be less presumptuous, if we fix our basis among the contingent symptoms of fever, viz. debility, spasm, increased action of the circulating system, or increased temperature of the body. Such grounds are fluctuating and uncertain in their places: they leave the theoretical explanation short in many instances, and they expose the practical rule to contradiction in all. We assume it as a fact, which no reflecting man will deny, that the base of the rule, according to which Nature acts, is simple, uniform, and consistent: the effect is general, and it moves under the influence of one principle. If we form a system of operation in our own mind concerning the laws of animal movement; and, if that fail in any one instance, we may be assured that we have not struck upon the principle through which Nature acts in producing the effect; for the acts in the system of Nature, though infinitely varied in appearance, rest ultimately on one base as relative to one subject. The base is concealed from the eye by incomprehensible subtlety. We cannot perceive the mysterious operation through which organic life is moved primarily, and maintained subsequently: we may notwithstanding, by frequently witnessing the succession of actions, attain such a degree of information, so as to establish the existence of positions with which a series of effects are connected; in so far that we may be enabled from the appearance of one thing to expect the occurrence of another, and, from a knowledge of the efficacy of means which are placed in our hands, be enabled to prevent by anticipation the occurrence of untoward events.—To this point I chiefly direct my view, in instituting theoretically a plan of cure, and in executing the particular steps of it practically.

I avoid all conjecture concerning the nature of dark causes, and I guard as much as I can against the imposition which is so easily made upon our senses by the presentation of partial symptoms. I thus confine myself to a consideration of what is plain, open, and ascertained, as connected with those forms of motion and action which are visible and distinct. Visible movement in the actions of the animal body is to be regarded as the utmost limit of our view, the boundary in fact which terminates our research. The movement is discernible by our senses; and it is then discernible that the forms of the action are various. As the forms are various, and as the variety of the form may be supposed to be a matter of importance in itself, it ought to be a preliminary object with the practical physician to note the different kinds, to discriminate the differences and to mark the deviations and degrees of deviation, not only between such as are regular or healthy, and such as are perverted or diseased, but between the different forms and degrees of the perverted or diseased order. In health, the movements are regular and energetic as suitable to the offices of just economy. In disease, they are changed; disturbed in time—accelerated or retarded; uncertain in manner—the action unusual and irregular,—excited and increased in force or oppressed and weakened in expression; in short, rendered more or less unsuitable to the purposes of life. This no one will deny, for the fact is obvious. As the natural, regular, and effective action of every one of the functions of the animal body constitutes the condition termed health; so the disturbed and changed action of one, or of the whole, constitutes disease. The physician's art is instituted to oppose and combat disease; hence the object of his pursuit is uniformly and constantly directed to restore disturbed and perverted action to its regular order and just force. This presents a self-evident base on which his act is founded; but it is a common base, the point of direction in which is not always sufficiently prominent. The forms which fever assumes, though fever be in itself intrinsically the same disease, are various; and, as remedies produce their effects only in correspondence with the form or condition of disease to which they are applied, it follows by consequence that the disease ought to be brought to one common level in condition, before a general effect be expected to follow the application of a common remedy,—such for instance as the affusion of cold water upon the surface. It is assumed as a preliminary position, in considering the effect of remedies, that every action which takes place in the living body arises as a consequence of the application of a cause of stimulation of one form or other; and it is farther implied in this position that every action, so arising, corresponds in expression with the power and quality of the stimulating cause, the susceptibility of impression and capacity of action in the subject to which the stimulation is applied. I thus infer that every power which makes impression upon the living subject, and thereby produces action, is in reality a stimulating power whether the action which follows the impression be vigorous or feeble. And I farther observe that while stimulating powers, acting by impression on the organic system, produce effects corresponding with the susceptibility of the organ, the capacity and active power of the part acted upon; so the impression of such power is sometimes silent or unknown to the subject himself, sometimes it is felt sensibly and strongly, the action consequent thereto accompanied with consciousness. Peculiar organs are excited into action by peculiar causes of stimulation. This may happen, either with or without the consciousness of the individual: And here, according to a law of organism, such of the causes as act on the system generally, and are new and unusual to the subject, make the greatest impression and produce the greatest effect. Among these, as powerful and unusual, the affusion of cold water on the surface of the febrile subject holds a distinguished place. This, applied suddenly and acting with impression on the surface of the body, communicates impression to the whole capillary or organic system. The application is followed by impression accompanied with consciousness; and, in proportion to the extent and form of the impression combined with the capacity of the re-acting power, so is the extent and form of the re-action which ensues. If the cold water, as affused upon the surface of the febrile subject, be allowed to be capable of producing an effective action, salutary in its nature and paramount to the action produced by the cause of disease, it may reasonably be supposed to be a powerful remedy for arresting the course of fever, even for restoring the just and natural action which obtains in health; and of thereby effecting the cure of the disease artificially and forcibly. Hence it may be expected, and it happens in fact that the application of cold water to the surface, as a power of forcible impression, actually arrests the erroneous course which obtains in fever. If it arrest the error, it is plain that it lays the case open to the action of the cause which excites and maintains the movements of health in its ordinary course; perhaps it moves such action by its own power, or it gives that form of impression to the organ which implies a salutary movement in its consequences. The power of cold water, viewed in this light, may be considered as ranking among the class of stimulants when applied to the surface of the febrile subject; for it acts impressively on the capillary system, and its impression is followed by a changed organic effect, that is, a form of action different from that which exists at the time. If it be applied in just quantity, and if it correspond in nature with the character of the stimulation which moves the action which belongs to health, as observation seems to inform us that it does, the effect may be expected to be the extinction of disease and re-establishment of health by a short process. If the disease be strong and move precipitously, while the means applied are presented in a weak and diluted form, no impression or a weak impression only will be made, and no salutary, at least no permanent effect will be assured. On the contrary, if the power of the remedy be condensed, or if it be applied in great quantity while the vital condition of the organic system is exhausted, weak and languid, the impression made by it may perhaps be so strong as to arrest, not only the course of the disease, but even to suppress the action of life altogether, and thus to occasion death. Hence, the business of the physician lies in preparing due susceptibility in one case, and in guarding against a too profuse use of means in the other: —by striking the just medium he attains the desired end with safety and effect.

Cold.

The affusion of cold water on the surface of the febrile subject evidently occasions a change in the diseased condition of the organic system; but, while this is admitted to be true, it may be a question whether the cold water,—the instrument through which the impression is made which induces this salutary change, actually effects its purposes through the quality of cold, or, whether something belongs peculiarly to water as a medium, which, condensing power, augments impression by momentum, and which, giving impulse, also supplies power to enable the organization to sustain the subsequent action effectively and vigourously through its course. The latter is the more probable supposition; but, as the point may not be thought to be perfectly clear, it will not be deemed superfluous to adduce examples of illustration, which, if they do not furnish demonstrative proof of the fact, may at least be supposed to advance the approaches towards it. In this manner, it is often observed that a person remains torpid in a faint, the animation suspended as in death while exposed freely in the cool and open air. He is roused to sensation and moved into action by the aspersion or affusion of water of the same, or nearly of the same temperature with that of the air in which he lies motionless. This fact is often witnessed in experience; and it seems to imply that there is something in the water itself, or in the force with which the application of it is made, abstractedly from its mere cold, which conduces to the production of the effect stated. The supposition is a fair one; and, in support of its truth, we may remark that where the extremities or other parts of the body suffer from exposure to cold, in a dry atmosphere, in such a manner as to become painful, the act of immersing them in water, or of washing them in water of a like or lower temperature than that of the surrounding air, removes the pain speedily; nay farther, the act of rubbing benumbed parts with snow or ice restores sense, life, and heat instantly, as if the particular temperature here applied, conjoined with moisture, possessed the kind and quantity of stimulation which best corresponds with the circumstances of the benumbed or painful condition, and which is best capable of repairing, safely and effectually, the injury done by the deranging cause. This is known to many; and it is also commonly known that aspersion with water artificially, or by a shower of rain naturally, revives the withered plant sensibly, instantaneously, and after a manner different from that which follows change of temperature in dry air. It is likewise known that a shower of rain, or aspersion of the animal body with cool or cold water refreshes the animal, whether man or beast, when exhausted with labour and worn down with fatigue, in a degree very different from that which arises from change of temperature without the addition of the moisture. In proof of this I may adduce an example from history which occurs often in military service, viz. that soldiers better support long marches in continued rain under all the disadvantages of deep and bad roads, than in weather of the same temperature without rain, and on roads of the best condition. It is even seen that where they are fatigued and exhausted, nay fainting with toil, a shower of rain coming opportunely revives them suddenly, and enables them to prosecute the march with vigour and alacrity. This is a well-ascertained fact; and it seems fair to infer from it that there is something in the water itself, as well as in its temperature, which, applied to the body of the febrile subject, makes peculiar impression on organic life, and which, while it impresses organism so as to change its condition and to move its action into a new channel, supplies the material which enables it to continue its operations with vigour and effect through its whole series of connection. In short, whatever be the nature of stimulating powers and organic susceptibility, we observe a high increase of the latter when moisture is applied to the surface of the body, particularly when the skin is washed with soap and water, and more remarkably still when it is scrubbed with soaped brushes. Hence, when the susceptibility of the surface is increased by this or other preparation, the application of cold water, according to a just and measured rule, restores vigour and activity throughout; and further, when this application is made to the naked body of persons labouring under certain forms of fever, it possesses the power, if properly managed, of not only arresting the progress of the disease, but of so influencing the condition of organism that obstructed channels, if I may so speak, are laid open and healthy action is induced to resume its course. We cannot pretend to define the steps of this operation; but we are enabled to observe many of the changes and occurrences as they advance in their progress towards a general result. The effect, which follows the affusion of cold water on the febrile subject, is strong and impressive; the effect which follows the admission of cool, pure and fresh air, is similar, but weaker in degree; the effect, which follows gestation or the act of travelling through the pure and open air in wheel carriages, is more conspicuous than that of mere exposure; and, as gestation is more safe in cases of great delicacy than the affusion of cold water, it is more elegible from its greater safety; and, in many cases, it is not inferior in effectiveness, particularly, as the management of it is perfectly under command, its power of action capable of being measured exactly to the condition of the subject on whom the experiment is made; while perseverance in the use of it may be safely continued till the purpose wanted be not only begun, but perfectly completed.

It appears, if not demonstrative, at least more than probable that cold water, affused upon the surface of the febrile subject, produces its salutary effect in virtue of some other property than that of cold simply subtracting or reducing increased heat; for it produces salutary effect where there is no evidence that increased heat exists in the subject of the experiment. If cold water then do not act by subtracting heat simply, it is plain that simple cold is not the property through which the salutary change is effected. This may be admitted; but it does not solve the difficulty. I do not know that I shall be able to throw much light upon it; but I shall attempt to illustrate it in so far as I can. And in the first place, I consider the living animal body as a machine in motion the movements of which are complex, in as much as the parts or organs of which it consists are many in number, various in structure and in function: the base, on which the fundamental movement is made, is notwithstanding one throughout, and simple in its nature; the varieties of effect,—and they are multifarious, produced by mode of organization, or by difference in the condition of cause as contingently applied to the subject. The air of the atmosphere, when properly constituted in purity, gravity and temperature, appears, from every circumstance which presents to us, the universal and proper stimulant of the life of terrestrial animals,—its successive impulses the cause which directly excites and maintains those regular organic movements which constitute the various actions of the animal system, and which support it in ordinary health and vigour. It may therefore be inferred that the application of a power which makes stronger impression than the customary pulse of the atmosphere, either from force of quantity, from novelty, or from other quality of character, cannot fail to excite action of a new form. It must however be supposed that, previously to the existence of the new form of action thus excited, an arrest of the motions which obtain at the time is necessarily effected, however momentary the duration of that arrest may be, and however different the character of the motions arrested be to those now produced. This point of arrest implies an interval from action, however short it may be. As such it may be considered as a sedative point following the operation of an agent on living matter ; and this is held to be the case, whether the subsequent action be accelerated or retarded in time, increased or diminished in force as measured by the standard of ordinary health. The arrest of motion is the first effect of forcible impression made upon the organic sensibility of the living body ; and, as the arrest produced is not supposed to injure or destroy the organization of the parts upon which vital action depends, the movement is renewed through the series of organs, the form modified in correspondence with the extent and character of the impression made by the application of the external or foreign cause. This fact is submitted to observation, and it occurs so commonly that there are few who may not have had opportunities of observing it. If a new form of action arise in consequence of impression made upon the susceptibility of organism, it will not be denied that the cause producing this effect is stimulant; for, it may be held as an axiom in animal economy that actions of a new form are correctly expressions of stimulating power, whether the action thence produced be subversive of movements which consist with health, or whether they subvert actions which constitute disease. The point here stated comprehends the general ground on which causes or remedies are supposed to act: the expression of the action varies in form according to the force of the cause and the relative condition of the subject to which it is applied; thus the effect is sometimes complete and permanent; sometimes only palliative and temporary. If we judge the case by reference to practice, we observe that the free admission of cool and pure air, more strikingly the affusion of cool and pure water upon the surface of a person ill of fever strongly impresses the organic system; and, in consequence of such impression, it produces a new condition of so marked a character that the train of action then going on is perfectly or partially arrested by it. But, as this arrest is momentary, and as it implies no destructive act among the parts essential to the manifestation of organic life, action or re-action ensues. This, if circumstances be favourable, is analogous with the action which obtains in health: on the contrary, if the circumstances be not favourable, that is, if the power of the cause and condition of the subject do not correspond, the effect is abortive: the diseased cause is not arrested, or health is not permanently restored: Hence it is observed that if the existing febrile action be strong and precipitous, the heat high above the standard of heat in ordinary health, the action, subsequent to the application of the means now alluded to, is probably lowered in degree and retarded in velocity; the heat reduced to its natural standard or near to it: On the contrary, if the forward action be weak and feeble, the heat lower than natural, the organic system susceptible of impression, and not so exhausted as to be incapable of re-acting when urged by suitable stimulation, the effect, subsequent to the application of the cold water, exhibits increased force and energy; and, among others, heat raised to its natural standard or near to it,—an effect following as a consequence of the form of action now produced. This is the fact; and a conclusion obviously arises from it that the terms stimulating and sedative, so commonly employed by medical writers, are merely relative to the condition of the subject upon whom the experiment is made. The appearances seem as if they contradicted each other: the act on the contrary is uniform and consistent. It rests on the simple base of a changed form of action by a cause of forcible impression. Whether the action be high or low, it attains its just medium and equal standard in consequence of the application of cold water to the surface. This proves clearly that the effect is not simply subtractive of excess:—it is subversive of error, whether that exceed or fall short of just measure.

Temperature.

The subject of temperature, as a distinguished symptom of the febrile condition, has generally obtained a considerable share of attention from medical writers; and, among others, the author of the Medical Reports has raised it to a paramount importance in regulating the cure of fever, when that is to be effected by means of affusing cold water on the surface. Every animal has its own peculiar temperature corresponding with the character of its organic structure; and even the different organs of the same animal have often something different from one another in this respect. In health, and in conditions of disease which depart but little from the order of health, the body maintains a certain level of temperature as a consequence of regular action in the organic structure. This level or balance of temperature, when lost or disturbed, is again restored by the restoration of that form of action which belongs to health. It rises in one case, and it falls in another according to changes produced in the organic action of the system; and, if this be so, it plainly implies that the change in temperature does not follow the subtraction or absorption of heat by the addition of cold simply, or that the febrile course ceases as an effect of mere change of temperature. The balance in temperature seems in fact to depend upon a law of action existing in organic parts; consequently, it follows the changes which occur in that action in whatever manner these may be produced: in other words, the action commands the temperature,—it does not depend upon it. Some of these unsteady movements, which occasionally appear in persons of delicate habit, illustrate very clearly the rule by which heat rises or falls as a consequence of changed action. The flushings and cold dampnesses which are here temporary and fleeting succeed each other rapidly: and, as their existence is obviously and visibly connected with the form and character of the existing organic movement, so the phenomenon ceases when the evolution has completed its own circle, or when it is arrested artificially and abruptly by means which impress the organs strongly, though these means are not in themselves of a cold nature, or supposed to operate through its medium. This occurrence presents itself not rarely in the history of animal health; and it affords some collateral explanation of the fact which is often observed in the history of fever, viz. that cold water applied to the surface, whether the heat be higher or lower than the natural standard, impresses the system forcibly, arrests the existing movement in consequence of its forcible impression; and thus changing condition, or as it were bringing parts into a new form of contact, favours the rise of action of a new and different character, —either the direct action of health, or a form of action analogous with it. The temperature of the living body is thus changed; and this change follows the changed form of action effected through the impression of a strong power, which is directly or contingently salutary in its operation: —it is not produced by the subtraction of the excess of heat through means of simple refrigeration.—I have stated the fact correctly as it has presented itself in my own experience, and I cannot avoid saying that I think the reason assigned for its existence is a satisfactory one; I may however add in further proof and illustration of it, as I have hinted before, that if the benefit of the affusion of cold water so decidedly manifested in certain forms of fever depended simply and solely upon the subtraction of existing increased heat, such benefit could not be well supposed to be other than temporary; for the remedy, in such supposition, acts upon an effect rather than upon a cause:—it absorbs the stream which flows; it does not suppress the source which generates. This is a fair inference easily understood. It might seem to be conclusive; but I may observe further that the doctrine of simple subtraction is rendered still less tenable by knowledge of the fact, that increased heat ceases while the febrile course goes on; nay more that the affusion of cold water produces salutary effects, or restores healthy action where no superabundance of heat is manifest, even perhaps where the just measure is deficient. If this be so, and my own experience will not permit me to doubt of it, no one will pretend to maintain that increased heat is the condition on which the remedy in question acts, or that subtraction of heat is the medium through which the cure of the disease is effected. Hence, as the principle of increased heat and its consequent subtraction by the application of cold water to the surface fail, on some occasions, in accounting for the effect which ensues, another must be sought for better capable of explaining the difficulties. This, as has been already stated, consists in general susceptibility of impression, conjoined with capacity of reaction equally diffused through the whole extent of the organic system. This may exist though the heat of the body be not preternaturally increased: hence this condition, which is consequently the favourable one for the affusion of cold water, does not consist absolutely and indispensably in the presence of increased heat. This is certainly true; yet I must add at the same time that it is often connected with heat generally diffused; nay even farther that it is capable, as has been shewn already, of being prepared artificially by means of it; viz. by promoting its diffusion and conducting its distribution skilfully to the exterior and extreme parts of the body. The general diffusion of heat visibly increases general mobility, and at the same time increases the activity of the vital condition; and, in accomplishing such effect, it becomes an agent of great value in preparing the fit condition previously to the application of cold water to the surface. This fact is unquestionable; but it has not as yet I believe sufficiently engaged the attention of those who employ the affusion of cold water as a remedy for the cure of fever, even of those who ascribe the virtues of the cold water to its power of subtracting increased heat. And here I must take the liberty of adding that, as I discovered, at an early period of my experience of cold bathing, the importance of the susceptible condition in giving effect to the action of the remedy; and, as that susceptibility is increased by diffusion of superficial heat, I have been in the habit of raising the temperature of the air of the bathing-room to rather a high degree; particularly when the weather is cold and raw, for the animation of the surface is then often deficient: I also have been accustomed to purify the skin in the most perfect manner by means of soap and warm water, for that highly increases susceptibility and gives energy to organism: I further animate it by friction with brushes or hot flannel cloths; and finally, when dry and constricted, I relax it by fomentations or oily frictions, changing and increasing its temperature and sensibility by the affusion of warm water, warm steam, or by immersion in the warm bath, as may seem best adapted to the case. This comprehends the first and simplest view of preparation for the affusion of cold water on the surface as a remedy for the cure of a certain class of fevers, which would not admit of the practice, at least which would not be extensively benefited by the application of the remedy without the preparation now described. But, as susceptibility in the organic system is the condition favourable to the action of this remedy when applied to the febrile subject; and, as susceptibility may be impaired or diminished by other causes besides the defective diffusion of superficial heat, the first step in the physician's duty is to ascertain the precise condition, and to remove the impediment, whatever it may be, which stands in the way of the just effect. The susceptibility to external impression may thus be suffocated or lost in a violent and tumultuous action, suspended by irritative constrictions, or oppressed by plethora ; in so much that ordinary, even strong means make no impression, or no impression powerful enough to arrest the precipitous course, or to move into activity that which is sluggish, stagnant or forcibly suspended. As we have shewn that susceptibility may be restored and even artificially exalted by increasing the expression of superficial heat, by promoting its diffusion, and by animating the skin by the various processes alluded to ; so it may be accomplished on other occasions by bleeding and other forms of evacuation, which, acting on the balances of the circulating system, produce a new condition of things; and which, among others, restore the functions of exhalation and absorption so visibly disturbed by the powerful action of the cause of the disease. The restoration of absorption indicates that susceptibility is restored; and restored susceptibility furnishes an indication for applying cold water to the surface with a fair prospect of success.

I now conclude this part of the subject, viz. the affusion of cold water on the surface as a remedy for the cure of fever. I am aware that there are many who will be disposed to think that I have been unnecessarily diffuse upon it, and perhaps there may be some who think I have not exposed it in a lucid order of arrangement. The circumstances in which I found the subject placed will serve to remove, at least to diminish these objections; for, it is plain that I had not only to detail my own practical plan and theoretical system, but that I had also to contrast them with the practice and doctrine of the author of the Medical Reports, which appear at present to command the opinion of the medical world on this head, and which, on that account, exact from me a particular consideration. I therefore thought it necessary to go into the subject at length, even to incur the chance of being reckoned tedious and garrulous, rather than to leave the reader in doubt of matters which are important to be known. I have now executed my task, and I trust I have so exposed the true grounds of the case that those readers, who take the trouble to examine facts and who reflect on the character and tendency of the facts presented to them, will be at no loss to find a guide for the direction of their practical course.

Conclusion.

CHAP. II.

Observations on the Effects of Cold Water given as drink in the actual state of fever, or where persons are preternaturally heated by exercise and exhausted by fatigue; also, some notice of the effects of immersion into rivers or cold waters in certain artificial conditions of habit consequent to exercise, or to exposure in the hot sun, particularly when the surface is relaxed and covered with perspiration.

I HAVE considered the practice of applying cold water to the surface of the naked body as a remedy for arresting the course of febrile disease at much length in the preceding pages. I there endeavoured to fix the rule of adjusting its mode and measure, according to the conditions of the subject, with as much precision as I could. I now proceed to add a few remarks concerning the effects of cold water given as drink; for this has also been employed as a remedy for arresting the course of fever, or for mitigating its violence; and though it be a remedy of weaker power, and a practice less novel in this country than the affusion of cold water on the surface, it is still a practice deserving of notice on this occasion. Cold drink, the coldest possible drink, is mentioned in

Early use of cold drink in fever.

the writings of Hippocrates as one of the remedies employed for the cure of the ardent fever *. It appears however to have been employed at this time only with a view of alleviating the pressure of symptoms. The first decisive attempt made to extinguish fever by means of copious draughts of cold liquid is ascribed to a person of the name of Petro as is stated in the writings of Celsus, viz. "*There was a person among the ancients of the name of Petro, prior to Herophilus and Erasistratus, but posterior to Hippocrates, who was accustomed to cover febrile patients with a load of bed-clothes that he might thereby raise both heat and thirst to a high point. This being effected, and the intensity of the fever beginning to decline, he then administered cold water in drink. If it moved perspiration, Petro concluded that the patient would disentangle himself; if it failed of this effect, he poured in more cold water, and then urged vomiting. If he succeeded in removing the fever in either way, he immediately gave roast pork and wine; but, if his success was not complete, he boiled some water with salt, and, forcing his patient to swallow it, rested the hopes of effecting his purpose by clearing out the alimentary ca-*

Petro's practice.

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* Και τα τε ποματα και τα ροφηματα διδοναι πυκνα και κατ᾽ ολιγον ὥς ψυχροτατα. Hipp. Opera, p. 518, edit. Fæsian.

*nal through means of vomiting**." This same Petro is mentioned by Galen, and the sum of the practice is stated by him in the tract *De Optima Secta*, though rather in an inverse order to that which I have now transcribed from Celsus. "*But Petronas was accustomed to give roast pork and black wine undiluted: he urged the sick to vomit, and satiated the thirst with cold water*†." The practice of giving cold water—the coldest water that can be procured, in small quantity but often repeated as a remedy in ardent fever, we can easily suppose to be grateful, refreshing, and even salutary. It grows naturally out of Hippocrates's theoretical doctrines; but the effect, according to Hippocrates's precept, can only be supposed to be temporary, the benefit palliative; while the bold attempt, which I have just now noticed, of arresting the course of the disease precipitately by copious draughts of cold water, and which appears to have originated with Petro, proceeds on different ground and moves to a more decisive point. I do not pretend to explain the theoretical view through which Petro attained this practice; but I perceive plainly the operation of a law in the conduct of his process, which serves to raise the chances of good effect and which also serves to secure the subject against accidents of danger. He increased the heat artificially by exterior covering, and he augmented the thirst purposely by provocation. The febrile movement was thus brought, if one may so speak, to the utmost boundary of its circle—to a point of nice balance. Here the cold drink was administered while the system was susceptible, and while the powers of life were yet vigorous: the impression was strongly felt: effective re-action might reasonably be expected to be the consequence, for we can easily conceive that, according to the force of the agent, the condition or capacity of the subject, the effect may be improved into a form of action similar to that of health, perverted into a form which constitutes established disease, or so mutilated and unhinged as to occasion immediate death.

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* Siquidem apud antiquos, quoque ante Herophilum et Erasistratum, maximeque post Hippocratem, fuit Petro quidam, qui febricitantem hominem, ubi acceperat, multis vestimentis operiebat, ut simul calorem ingentem sitimque excitaret. Deinde, ubi paulum remitti cœperat febris, aquam frigidam potui dabat: ac si moverat sudorem explicuisse se ægrum judicabat; si non moverat plus etiam aquæ frigidæ ingerebat et tum vomere cogebat. Si alterutro modo febre liberaverat, protinus suillam assam, et vinum homini dabat. Si non liberaverat, decoquebat aquam, sale adjecto, eam bibere cogebat, ut vomendo ventrem purgaret. *Lib.* iii. *cap.* ix.

† Πετρονας δε και κρεα ὕεια οπτα διδοναι και οινον μελανα ακρατεστερον, εμειν αναγκαζε, και ὕδωρ πινειν ὅσον ηθελον.

Galen. Opera, de Optima Secta, p. 22.

The practice of giving cold drink as a remedy for the cure of fever, which originated as has been shewn with Petro, passed into most civilized countries where medical science was cultivated, variously modified by the caprice of individuals or the fashion of the times; but never perhaps at any time justly appreciated in value, or thoroughly understood in principle so as to be managed in practice with safety and effect. The exhibition of cold water for drink as a remedy for the cure of fever was a common practice with the Greek physicians; and Galen, the most copious writer, and perhaps the best practitioner of his age, laying great stress upon its virtues, employed it freely in various forms of febrile disease, and as far as we can judge with very fortunate results. I shall only notice one of his illustrations, viz. "*A young man,—a hot and dry subject, was attacked with fever consequent to a fit of passion. This was in the hot weather of the dog-days; and, while the disease was yet in its first paroxysm, he drank two measures of cold water,* (more than an English pint), *in consequence of which he immediately vomited the purest yellow bile, to which an evacuation downwards succeeded soon after. He then took some refreshment of food, drank one measure of water more and obtained a complete solution of his fe-*

Galen's experience.

ver[*]." He adds, however, "*that great nicety is required in adjusting the measure where cold water is administered in cases of the character described*[†]." This practice of administering cold drink in fever either originated with the physicians of the East themselves, or it was transmitted to them with the other doctrines and practices of the Greek school. We conclude that it was a remedy with their great physician Avicenna; for he alludes to the custom of some persons employing it with a boldness which others might be disposed to consider as dangerous. "*The physician*," he observes, "*frequently drenches the febrile patient with cold water; in so much that his colour collapses and he shudders in consequence,—the quantity amounting even to a measure and a half*[‡]." The passage which I here transcribe from Avicenna appears to have been copied from the works of Galen; and, if the *hemina* be understood to be only nine ounces, instead of being taken in its

Avicenna.

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[*] Ὁ γουν εκ θυμου πυρεξας. εν τοις ὕπο Κυνα καυμασι, θερμος και ξηρος νεανισκος, εν τω πρωτῳ παροξυσμῳ πιων ὕδατος ψυχρου δυο κοτυλας, αυτικα μεν εμεσε χολην ξανθοτατην, εξεκρινε δ᾽ ολιγον ὕστερον, και κατω, κα᾽πειτ᾽ αυθις επι τροφῃ λαβων ὅμοιως ὕδατος οσον κοτυλης, ουκετι επυρεξεν. Galen. Oper. de Cur. Morb. lib. x.

[†] Πολλης γαρ ακριβειας δειται κατα το μετρον επι των οὕτως εχοντων, ἤ δοσις του ψυχρου. Ibid.

[‡] Avicenna, tom. ii. p. 12. Edit. Arab.

looser sense for a pint English measure, we cannot well suppose how so great an effect as that of shuddering and collapse should follow a draught of cold water of fourteen ounces measure,—unless the water was iced water.

The practice of giving cold drink, even of giving snow and ice water, as a remedy for the cure of fever, appears to have been common on the shores of the Mediterranean in the last and preceding century. It was even adopted in the northern latitudes of Europe; for, we find that some of the most eminent of the German physicians of the two last centuries speak of it in terms of high commendation. Lommius, an inhabitant of the Netherlands, is distinguished for his praises of this practice. "*I have cured,*" observes Lommius, "*not a few persons by this method of treatment. When the subjects of my discipline had attained the height of the continued fever, tormented with very great thirst and very great heat, I asked if they had a desire to drink, (the water being even presented in sight for the sake of provoking the desire). I then permitted them to drink, when the ideas were engrossed wholly by the desire, so that they swallowed the liquor with avidity at repeated draughts—in the quantity of three or four pints; in consequence of this, evacuations by stool, or vomitings of yellow*

Lommius.

bile soon afterwards took place, the bile being discharged together with the liquid which had been thus taken in. After this had taken place, the patient being laid in bed properly adjusted and well covered with clothes sweated profusely, or slept soundly the whole of the night; when, awaking from sleep, or ceasing to perspire, he perceived no remains of fever *."

Besides Lommius, there are several medical writers, even in my own possession, who speak highly in favour of the good effects of cold drink in certain conditions of acute disease; but I do not hold it necessary to trouble the reader with further detail on the subject as the case is not such as to require additional proof. I shall however beg leave to direct his attention to the Memoirs of Baron Trenck, which supply us with one of the most explicit examples of the efficacy of large draughts of cold water in arresting the course of a fever of great violence that I have any where met with. I do not at present possess the Baron's memoirs, and I only recollect the circumstance generally, for it struck me strongly at the time of reading it, near twenty years ago. It is shortly this: The Baron, when confined in the prison at Magdeburg and ill of a fever, broke the pitcher which contained his daily allowance of water soon after it had been delivered to him. The fever was violent, and he suffered inexpressible torment from thirst for the space of nearly twenty-four hours. When he received his supply at the time of the customary visit, he seized the pitcher with eagerness, swallowed the water with avidity and satiated his thirst completely. The thirst was quenched, and the fever, extinguished as by the power of a charm, did not return again. Such is the substance of the history: the Baron may not perhaps be considered as good medical authority; but the effect of the practice is so similar to that which once happened in my own person that I have no hesitation in giving credit to it. In the year 1779, at Savannah in the province of Georgia in North America, in the excessively hot weather of the month of July, I was attacked with the fever which then prevailed at that place,—a disease which in the cooler season is intermittent, but which, in the hotter months of the year, has rare-

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* Curavi equidem hac via ægros haud sane paucos, qui cum ad statum pervenissent continuæ febris ac summa siti, summisque ardoribus afflictarentur, rogati bibere, ne cupiant ostensum (quo cresceret bibendi desiderium) fontem, ipsi in lympham intensissimi, ubi semel atque iterum, ad libras tres quatuorve avide haussissent, paulo post dejicere vel vomere cœperunt flavissimam cum epota aqua bilem. Postque reclinati, ac probe operti mox uberrimis sudoribus totas noctes vel etiam altissime dormientes defluxerunt, quibus finitis omnem in posterum amiserunt febricitationem.

Lom. de Curand. Febr. chap. xi. *sect.* 3.

Baron Trenck.

The Author's experience.

ly either cold stage or distinct intermission. In the third exacerbation of the case alluded to, my desire for cold water was ravenous; in short, it appeared as if the whole force of the febrile cause was exerted in the production of inordinate thirst, for there was not at the time any other symptom which attracted my notice. In this state of torment from raging thirst, I desired to drink cold water; and, notwithstanding the unwillingness of those who were about me to comply with my request, a jug was filled from the pump,—to the best of my recollection nearly a quart. This I drank at one draught; but the thirst still continued. The draught was repeated in a few minutes—but not to the same extent: the thirst was then completely extinguished, and I could not after that well say what other part of fever remained. I went to bed about the usual time,—for it was then evening, and passed the night in a pleasing reverie, or slight delirium. Next morning, when the impression of light was sufficiently strong to fix my wandering ideas, I began to examine my situation; and, among other things, found the epigastric region to be much distended, but without pain, the eye slightly yellow; while, together with this, I felt unusually languid and feeble; though I perceived no remains of fever; and even these symptoms vanished in a few days, quickened in their retreat perhaps by some doses of calomel and rhubarb. Such is the fact; I notice it as an instance of extinguishing fever by copious draughts of cold water; but I do not notice it as an example for the imitation of the practitioner.—The experiment was made at random; and, that no evil followed from it, was probably more owing to the original soundness of my constitution than to my caution. I do not know the precise temperature of the water employed upon this occasion; but, as it was pump-water and drank at the instant it was drawn from the pump, it may be supposed to have been somewhere about 57°: the quantity I conclude to have been near three pints.—Such was the practice, and such were the effects in my own case. It is worthy of remark that, though the fever was extinguished in the manner stated, neither vomiting, sweating, nor any other sensible evacuation ensued,—effects which are said by writers to be the usual concomitants of water drunk in the circumstances described and in the quantity here implied. There is here some difference in point of fact, the reason of which probably is that the ancients, and those who imitate them, generally administered the cold drink only in the advanced stage of fever, frequently near a critical period, or at the height of the paroxysm,—a time, at which it is not possible to ascertain what part of the effect belongs directly to the genuine operation of the remedy, what contingently to the prepared condition of the subject. The cold water was here drunk at an early period of the paroxysm: it decidedly arrested its course or changed its condition; but I cannot, in looking back upon the case, pretend to say that it did not bring life into danger. The urgency of the thirst was unusual, and the means employed to extinguish it were carried to an unusual extent. They touched the extremes, consequently the example is not a safe one for imitation. I shall therefore mention, from experience in my own person also, an instance of the free use of cold water in another shape,—in such a one indeed as may be supposed to come more within the rule of common practice than that related above. In the year 1778, in the month of October, I was attacked at Kingsbridge on New-York Island, with an intermitting fever of complicated form, attended moreover with some untoward symptoms through the whole of its course. I took an emetic at the first accession, and afterwards a strong dose of jalap and calomel; but the type, notwithstanding the effective evacuations thereby procured, still continued uncertain and anomalous, affording no fair opportunity for the exhibition of bark. I had an utter abhorrence of every sort of food or sustenance except cold water. This I drank without measure, probably not less in quantity than two gallons *per* day. The water was excellent; and, as brought directly from a spring in a rock close to my tent, it was cool and refreshing. The pitcher stood by me:—I drank whenever I had a desire to drink without limiting myself in quantity, and I subsisted on water alone till the seventh day when the fever terminated of its own accord. I still recollect the grateful refreshment which it gave me; and I may add that though the fever was not extinguished by it, nor any of its paroxysms suppressed in the manner stated above, yet, the exacerbations were evidently mitigated, and I experienced comfort and even pleasure from it, not obtainable by any other means within my command at the time.

Rules to define its use.

I have cursorily noticed the origin of the practice of giving cold water internally as a remedy to assuage the thirst and soothe the sufferings of the sick, or to arrest the progress of fever abruptly. I shall next endeavour to give some rules for regulating the employment of it in the more delicate conditions of disease. If it be the intention of the physician to administer cold water to a febrile subject in quantity sufficient to satiate thirst completely, to impress organism, to arrest erroneous action, change condition, and thereby contingently to disunite and extinguish the chain of febrile operation, it is plain that the means stated, unless applied in very great quantity, must be concentrated in force, that is, of a low temperature—iced water if possible. Thirst is the symptom which we expect to extinguish immediately by large draughts of cold water. If the action which occasions that expression of disease be inordinately high, so as to absorb, if I may so speak, all the other symptoms, we may reasonably expect that a cause which extinguishes thirst primarily and effectively may also extinguish fever contingently, in as much as the disease is manifested most conspicuously in the expression of inordinate thirst. If we therefore expect to cure a fever abruptly by the exhibition of cold water, it is necessary that we refuse drink to the urgent desires, that we provoke thirst by denial till it become outrageous; and, having done so, that we do not allay it merely or quench it gradually, but that we extinguish it as it were at one stroke. If the prominent symptom be thus extinguished, and a new form of action induced by strong impression made upon the organ which principally suffers; the other deranged actions, which are minor actions, may be supposed to be sometimes changed,—the disease to cease contingently. But, though the ground now stated be the only one which gives expectation of rendering cold water decisive as a remedy for the abrupt cure of fever,—the ground upon which Baron Trenck and myself struck by accident, that which is formally recommended by Petro and Lommius; yet I cannot, in viewing it with all its consequences, consider it to be a safe one. The sensation of thirst is often an ambiguous sensation; and, if we mistake the sensation of thirst as combined with faintness from exhaustion, for sensation of thirst as combined with a locally increased or perverted action in the organ in which this sense resides, the practice now stated must be held to be one of the most extreme danger. The dangerous condition is evidently connected with increased sensibility joined with diminished power of action, whether generally or locally. In this manner, if the sensation of thirst combined with languor and faintness should present itself in the decline of the paroxysm of a fever which terminates by a free and copious perspiration, the perspiration subsiding and the susceptibility increasing, the desire of drinking ought not to be then gratified by large draughts of cold water swallowed suddenly. The effect is dangerous: it may even be fatal; for the power of the means is concentrated, and the organ to which it is applied is in a diminished state of activity. In such case, excess in the measure, or force in the manner of applying the means, instead of exciting and reviving, may arrest, even suffocate the vital power for ever. We can thus understand in what manner large draughts of cold water become hurtful under copious perspirations which have continued long: —The powers of life are here exhausted by the waste of its preceding exertions, and they are not as yet recruited by a sufficient interval of rest.

Cold drink is said to be hurtful in the cold stage of the intermitting fever; and medical writers seem to be of opinion that it is not safe, or that it is little suitable in fevers of the intermitting type in any state. I cannot entirely accede to this opinion, for my own experience furnishes ample proof that cold water may be drank freely and in large quantity, not only with safety, but with advantage, in many conditions of this disease. But, while it is perhaps less proper in the regular intermittent, or ague and fever than in some others, it is admitted to be particularly serviceable in the bilious remittent, or *causus* of the ancients. There the force of the disease is chiefly manifested in the functions of the alimentary canal and biliary system; and, in such case, its impression, when made suddenly, forcibly and in quantity, produces changes in the diseased parts by direct effect. It also is observed occasionally to give relief in certain forms of dysenteric fever. But here I must caution the young practitioner not to employ it inconsiderately; for the effect is dangerous where the sensibility has been previously increased by strong purges, which, occasioning copious evacuation, often imply in their consequences a certain degree of exhaustion which does not admit the application of strong means with safety.

What has been now said concerning cold water given as drink in fever, though not all that might be said upon the subject, will serve to fix the outline of the rule which ought to guide us in the exhibition of it when employed as a remedy for the abrupt cure, or temporary alleviation of the more urgent symptoms of the disease. It is safe where a form of action, such as may be termed forward, predominates in the part to which it is applied; it is effectual where that form of action which generates the thirst constitutes the more prominent action of the febrile cause; it is dangerous where susceptibility is highly increased and where the vital energies are weak; it is ineffectual where febrile action is irregular, and where it is so disposed that the application of the means cannot be made directly to the seat, or near to the seat of the error; and finally, it is ineffectual or beneficial only for a short time where its power is not sufficient to impress the system so as to arrest the cause of the diseased or perverted action decisively, and at the same time to move one of a salutary nature, vigorously and effectively, in all the organs of the body.

Effect from drinking cold water when heated and perspiring.

I have noticed, at some length, the effect of cold water taken into the stomach as drink, either with the view of arresting the course of fever abruptly, or of mitigating the violence of its symptoms. I shall now notice in a cursory manner some of the more striking of its effects, when swallowed in large draughts under certain conditions of habit, which are not strictly speaking morbid, but which imply a deviation from the customary order of health. This condition is most commonly produced by exercises carried to excess, by exposure to the intense heat of the sun or other causes, which, exhausting, if I may so speak, the fund of vital power by overstrained and long continued action, induce fatigue and inability accompanied with increased susceptibility to impressions, or preternatural avidity in the system of absorbents. The accidents which happen from drinking cold water greedily, under the condition which often arises from the circumstances described, are numerous in the histories of medical record; and they are various in degree of force—from slight derangement to total suppression of life. The following is an instance of a somewhat peculiar kind which occurred within the circle of my own experience. A planter in the island of Jamaica, in the year 1777, riding in a cane-piece about ten o'clock in the forenoon, superintending his negroes who were employed at labour in the field, struck with the appearance of some water which a negresse had brought from an adjoining spring, desired to drink. The sun was very hot, and he was warm: he drank the water from a calabash, and swallowed it with avidity for it was cool and grateful. He then rode on; but he became faint and giddy almost immediately, and he reached his house with difficulty. His ideas became singularly deranged: timorous and fearful to be left alone, he could not resist the impression that himself and all nature was sinking into rest. Very slight causes occasioned very strong apprehensions; and, among others, the striking of a clock which stood near his bed-chamber was so annoying to him that he desired it might be stopped. It brought the idea of dissolution home to his mind—somewhat in the manner that the striking of the clock may be supposed to remind the condemned criminal of his approaching hour. The blank before him was awful. But these disturbed sensations, so dismal and distressing as they were, abated in the course

Case of a planter in Jamaica.

of a few days, and wore off in the course of a month, though they were liable to recur at intervals for some time. I however conclude that they ceased entirely before long; for, though I left the island soon after this occurrence took place, I know that the person alluded to became extremely active in his habits in the subsequent period of his life, bold in his speculations and fortunate in his undertakings beyond the example of any planter on record.—The effect of the cold water was chiefly manifested in this case by the change induced upon the sensations as connected with mind; in others the effect is chiefly confined to the organ to which the water is immediately applied; the structure of which is sometimes so much injured as to exhibit signs of inflammation, mortification, and local death; and, on many occasions, sudden cramp or spasm is induced by it in such extent as to strike the subject dead at once by a first impression—like a stroke of lightning.

Frequency of accidents of this kind in North America.

Instances of sudden death from the effect of drinking cold water incautiously when the body is overheated, its powers exhausted by extraordinary exertion of the limbs in severe exercises carried to fatigue, or by exposure of the surface to the irritations of a powerful sun, occur occasionally in almost every country:—they are frequent in

North America. The summer months are excessively hot in many parts of the American continent: the perspirations are there usually copious and free;—the susceptibilities preternaturally increased as in cases of relaxation. The water of the springs is cold; consequently when it is drank with avidity and swallowed in quantity, at the source or at the pump, by persons covered with perspiration and thus highly susceptible; particularly, if they be at the same time faint, panting and agitated from the effects of preceding exertion or the action of a scorching sun, the effect is oftentimes fatal.—Such accidents happen not rarely among the inhabitants in peaceable times: they may be supposed to occur more frequently among troops who are employed in active war in that country; and accordingly the American war produced many instances of this kind.

Supposed cause—or condition of body.

I have given some notes of history in the preceding pages, and stated some points of difficulty relative to the exhibition of cold drink when employed as a remedy for the cure of fever. I have also added a very cursory historical notice concerning the incautious internal use of cold liquid,—not as employed in fever, but in certain artificial conditions produced by the action of causes which preternaturally augment susceptibility, and which exhaust the powers of life unduly by long continuance of exertion. Thus it is that cold drink, which is harmless, nay beneficial and restorative of health and strength at one time, is injurious, subversive of health, even abruptly destructive of life at another. It will not be denied that it is a matter of importance to ascertain the condition upon which this varied action of cold drink depends; but the discussion is involved in some difficulty. We are ready to form conjectures; but we often err in our conjectures for we cannot pretend to penetrate the intimate nature of ultimate causes,—not even to fix the real instrumentality of the act in any one of the simplest which present themselves in the circle of Nature's works. We have it however in our power to notice and identify circumstances of subject to which causes are applied, and to remark the effect which follows from the application of means of different orders. But, though this much at least is attainable, we do not find that the authors who have written on this subject are agreed on the condition which is essentially connected with the effect, or on the principle through which the effect is produced when the cause is applied.

Dr Rush of Philadelphia, the celebrated physician of North America, has written professedly concerning the accidents which follow from drinking cold water imprudently, when the body is overheated. I have not seen the original tract; but Dr Currie, who notices it and contrasts the opinions therein contained with his own, does not acquiesce in the reasoning, or rather in Dr Rush's record of the fact. Dr Rush asserts three conditions, viz. 1. "*The subject is extremely warm: 2. The water is extremely cold; and 3. A large quantity of it is taken suddenly into the body. The danger from drinking cold water, is always in proportion to the degrees of combination which occur in the three circumstances that have been mentioned.*"—Medical Reports, vol. i. p. 105. Dr Currie also assumes three conditions, viz. 1. "*The body has been previously heated beyond the temperature of health, by exercise carried to fatigue. 2. To this violent exertion a state of rest has succeeded. 3. A profuse perspiration had taken place.*"—Med. Rep. vol. i. p. 100. Such are the positions of these authors on this subject. They are not precisely the same; but I am not sufficiently acquainted, in my own experience, with the history of accidents of the nature alluded to to reconcile the difference. It however appears to me, even judging the case by the examples extracted from Schenck and inserted in the Medical Reports, that the conditions presented by Dr Rush correspond better with the fact than those insisted upon by Dr Currie. The body may be supposed to have been preternaturally hot in all at the time the water was swallowed; for the subjects of the histories had been heated by exercise carried to excess, and they were not yet cooled by rest, or refreshed by sleep when the cold liquid was received into the stomach. The water, or liquor drank was likewise comparatively cold; and it was swallowed with avidity and in great quantity. These conditions attach, not only to the examples extracted from Schenck, but they apply to the most of those which history presents to us as occurring in war, or other occasions which imply acts of great exertion under a scorching sun. We cannot speak with certainty of the precise degree of heat of the subject in the cases referred to; for the thermometer was probably never applied to the body previously to drinking the water in any one instance where these accidents occurred. But, though the degree be not known, and though it may in fact be lower than before perspiration commences, we cannot well suppose it to be lower than the heat of the natural temperature; for the liquid is swallowed before there is an interval of rest sufficient to allow its increased quantity to dissipate or subside. Thus Dr Rush's conditions seem generally to exist: I do not think we can fairly allow Dr Currie's second position to be well founded; viz. "*That a state of rest had succeeded to* *the exertion.*" I admit that exercise or exertion may have been suspended momentarily; but it is evident that agitation and tumult still continue: the circulation is rapid; the respiration hurried—even to panting; the perspiration profuse, and the superficial heat not yet sunk to its natural standard when the cold liquor is swallowed. We all know that it is swallowed as soon as it can be obtained, whether the subject be a soldier on the march, a common traveller on the road, or a person engaged in athletic exercises: I cannot therefore admit the position to be just that there is really a state of rest; though I do not deny that the violence of the exertions, which raised the heat and thirst and which exhausted the force, may be abated or momentarily suspended.

When the history of the accidents, which have occurred at different times from drinking cold water, are viewed fairly and dispassionately, every thing which relates to temperature, whether by excess or defect, appears to be capable of being separated from the cause which primarily and indispensably constitutes that condition of habit, which is pregnant with danger when cold liquor is thrown into the stomach in quantity. But, though we may separate the dangerous condition from excess or defect of heat, we cannot separate it from a certain avidity of desire, which is expressive of a want, and which is connected with susceptibility so excessively increased that the impression of powers of strong force becomes dangerous, even destructive of life by direct effect. Every person is, I believe, acquainted with the fact that cold water may be drank in quantity and with impunity where the general heat of the body is highly increased; hence we infer that excess of heat is not the condition which renders this practice dangerous as is believed vulgarly, even as is believed by Dr Rush. On the other hand, cold water may be drank freely and safely on many occasions where the heat does not rise above the healthy temperature; even where it declines from a higher to a lower, provided tumults and agitations have ceased, or provided the action of the system has recovered its just balance. If this be so; low or declining temperature cannot be held, in strict propriety, to be the fundamental cause on which the danger arising from cold drink depends as appears to be implied in the assumption of Dr Currie. But, though the higher or lower degrees of temperature do not comprehend the real cause which renders the action of this power dangerous abstractedly; yet, where the susceptibility of the organ is highly increased as expressed by a sense of want, and where the power of re-action is at the same time diminished as connected with exhaustion, the danger is always great. It bears proportion with the susceptibility or avidity of desire in the subject which sustains the action, the quantity or force of the means which is allotted to satisfy the want or desire. The force of the agent consists in the coldness, the quantity, and suddenness of the application. Susceptibility, which is a feeling of want, consists in inanition: it is connected with exhaustion from the expence of previous exerted action of the limbs, or from the impressions of a powerful sun irritating the exterior of the body, and thus perverting the just balances of action. The stomach in this case is faint, that is, it is in a state of inanition thirsting for supply, and thus highly susceptible; consequently its structure, under such avidity of desire, is easily impressed; and, while easily impressed from susceptibility and weakened from exhaustion, its action is liable to be suffocated, or suspended abruptly by the application of strong force, particularly by cold water drank in quantity. The fact is admitted that life is sometimes arrested suddenly by cold water—drank with avidity and in large quantity. In searching for a cause to account for the fact, we cannot pretend to say that subtraction of heat is the medium through which the effect is produced; for if it were, a gallon of cold water affused upon the surface might be expected to occasion death more instantly than a pint of the same fluid received into the stomach, yet this is not the case, The surface may be affused lavishly with cold water, not only with safety, but with advantage. The stomach receives it with risk in small quantity; a large quantity suspends its action, and occasions death. Hence it may be inferred that the danger arises from the misapplication of means.—The stomach solicits supply for the expenditure of the whole body; and, if I may use the expression, appears to be overwhelmed by its avidity. There is indeed a feeling of want, in other words thirst; but the character of thirst is here different from that which arises under the action of a febrile cause. In the one, cold water may be drank in quantity with impunity; in the other, not without danger. But when dangers have arisen from the cause stated, Dr Rush recommends "*liquid laudanum as a remedy, in the quantity of a tea-spoonful: sometimes even near a table-spoonful has been given before relief was obtained.*" He considers laudanum as a certain remedy in this case. If the fact be correct, I do not know how the effect can be explained by a change operated upon the state of heat; for, though laudanum allay irritation and diminish increased sensibility as it were specifically, it has no direct or specific effect in restoring subtracted heat; and, as such, it could not be supposed to find place among the means to be employed by Dr Currie: the question is difficult, and I leave the solution of it to those of happier genius than myself.

Precautions in drinking cold water.

Dr Rush suggests some cautions to be observed by those who drink cold water under the conditions described; viz. "*to grasp the vessel out of which they are about to drink for a minute or longer with both hands; or, if they drink at the pump or spring, to wash the hands and face previously to drinking with a little of the cold water; for* (he says) *that by receiving the shock of the water first on those parts of the body, a portion of its heat is conveyed away, and the vital parts are defended from the action of the cold.*" Dr Currie maintains that Dr Rush's notion of the causes of the disease, as well as the method of cure founded on it, rests on an erroneous base. I do not advocate the truth of Dr Rush's explanation of the fact, for it seems to me to go beyond the sphere of certain knowledge; but I hold the practice to be, upon the whole, safer than that of the author of the Medical Reports, who appears to ascribe safety and salutary effect principally to the existence of preternatural heat. I am ready to admit that cold liquid may be drank freely on many occasions with impunity where the heat of the body is preternaturally increased; but I must also say that there are numerous instances on record where the effect has been hurtful or dangerous, though the heat of the body, according to the best attainable estimate, was actually higher than that of ordinary health. As this is unquestionably true, precautions, somewhat of the same kind as those recommended by Dr Rush, are, I think, to be attended to on all occasions; and, among others, it is to be particularly enforced where a person is heated by exercise, exhausted by fatigue under a scorching sun, and at the same time desirous to drink, that the surface be cooled primarily by washing the face and hands, breast and temples, and by rinsing the mouth repeatedly before the liquid is swallowed; and finally, when it is at last swallowed, that it be taken down by mouthfuls at a time, so that it may act upon the stomach as an aspersion rather than affusion. The mode, here recommended, bears analogy with the aspersion, which is stated above to be the safest and most eligible mode of applying cold water to the surface, in conditions of fever where the powers of life are weak and the superficial susceptibility highly increased.

But, while cold water drank in quantity proves salutary, even decisive of cure in certain states of fever; so it is sometimes injurious to health, Immersion in cold waters under perspirations.

even fatal to life in certain artificial conditions consequent to exercise, fatigue and other causes of exhaustion. In a similar manner, as the application of cold water to the surface is a remedy of great value in many forms of fever, so the application of it, at least immersion in cold springs or cold rivers, even the stronger impulse of a dry atmosphere is often injurious, sometimes fatal, when made to the naked body under the artificial condition of profuse perspiration, particularly perspiration long continued; for such condition is ordinarily connected with increased sensibility of surface and general increased susceptibility of impression. The fact is well ascertained; and, admitting it to be true, we can easily suppose injury of all degrees of intensity—from slight febrile indisposition to severe fever, general cramp and instant death, to follow as a consequence of immersion in cold water in particular circumstances of habit. I shall mention some of the slighter effects of immersion in cold water or exposure to rains which I have experienced in my own person; for, as the chances of life have sometimes exposed me to these trials, I believe I have thus had the opportunity of feeling what would most probably have escaped my observation if I had attempted to judge the condition of another. I may however remark in the first place that my skin is naturally of a soft texture; and, some years ago, it was rendered more so artificially by the constant use of flannel clothing. It was in fact soft, relaxed, and its heat was ordinarily of a low temperature. In this state of habit I once bathed in the open sea in a summer month, in the north of England. I felt the impression of the immersion strongly, and, after I had dressed myself and put myself in motion, I felt a vigour and power in my limbs that I had not known for some years. The whole series of organic action seemed as if it were placed upon a higher key; in fact it was so high pitched that it appeared to touch the febrile point in the course of the following night, for the arteries beat strong and with febrile velocity, the skin was warm and glowing, a gentle and easy perspiration ensued, and next morning I was in my customary health. This case furnishes an instance, where immersion in the open sea, in a summer month, affected the balances of the system in such a degree as to occasion a fever of temporary duration. In a similar manner exposure to a shower of rain, particularly in a tropical climate where rain falls as from a bucket or shower-bath, has oftener than once so far impressed my habit, which is naturally susceptible, as to occasion febrile movements in the course of the following night, even sometimes pains and occasional spasms for some succeeding days. This was more certainly the case if the skin happened to be relaxed and covered with perspiration at the time I was exposed to rain, whether by the effect of exercise or of hot air. But, as changes to the extent stated occur not unfrequently as a consequence of immersion in cold water, or of exposure to heavy showers of rain in tropical countries; so similar indispositions sometimes arise in consequence of the impressions of currents, or strong impulse of streams of common air applied to the body when it is covered with perspiration, or bathed in sweat; more especially if the person be composed in sleep. If the causes now noticed occasion such changes as I have described, and there is no doubt of the fact, there can be no great difficulty in comprehending how stronger causes acting on the same conditions, or the same causes acting on conditions more susceptible, may produce a decisive subversion of the customary health, viz. a severe fever, a general cramp or spasm, even instant death. History furnishes examples of the case in all its degrees from mildness to intensity; and the author of the Medical Reports adduces a very marked one in the instance of Alexander the Great, whose life was brought into imminent danger by bathing in the river Cydnus, when he was overheated and perspiring profusely. Dr Currie considers the case of Alexander as furnish-ing an illustration of the theory which he has assumed on the subject of bathing; and, on that account, I cannot avoid noticing it at some length in this place. The Doctor supposes Alexander "*to have been cooled as well as debilitated by excessive perspiration and fatigue, and, under such circumstances*," (he says) "*immersion in the cold and rapid Cydnus was followed by the consequences which should be expected from the principles already laid down, viz. subtraction of heat.*" This is the Doctor's opinion of the case; but if we allow ourselves to be guided by Quintus Curtius, whom the Doctor would appear to have chiefly consulted as his authority, we shall scarcely be disposed to think that the historical fact warrants his conclusion. The words of the historian are expressly the following: "*It was then the summer season; and during summer no country on the face of the globe feels the influence of the sun more powerfully than the sea-coast of Cilicia: as it was the hottest season of the year, the hottest period of the day had then commenced. It was at this time that the limpid waters of the Cydnus invited the king, who was covered with dust, and bathed in sweat, to wash and refresh himself in the stream; for he was still hot. In this state he plunged into the waters, and he was seized in an instant with shivering and cramp of his limbs. A deadly pale-*

Case of
Alexander
the Great.

*ness was spread over him, and the vital heat almost entirely withdrew; so that he seemed to be in the act of dying, when the servants, taking him up in their arms, carried him to his tent in a state of insensibility**." I leave to the reader to decide whether the text of Quintus Curtius sufficiently justifies Dr Currie's construction of the passage; it is there expressly stated that Alexander was yet hot. Other historians agree in the fact of the increased heat; and, among these, Arrian observes, " *that Alexander, according to Aristobulus, was attacked with an illness in consequence of fatigue; but, according to others, allured by the beauty of the waters of the Cydnus, he threw himself into the stream with the intent to swim, while he was sweating and preternaturally hot. The Cydnus flows through the middle of the city; and, as its sources rise high on Mount Taurus, and, as it flows through a pure soil, it is cold, and at the same time clear: Whence Alexander, while bathing in this stream, was sei-*

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* Tunc æstas erat; cujus calor non aliam magis quam Ciliciæ oram vapore solis accendit; et diei fervidissimum tempus cœperat: pulvere ac sudore simul perfusum regem invitavit liquor fluminis, ut calidum adhuc corpus abluerit. Descendit in flumen, vixque ingresso subito horrore artus rigere cœperunt: pallor deinde suffusus est, et totum propemodum corpus vitalis calor reliquit, expiranti similem, ministri manu excipiunt, nec satis compotem mentis, in tabernaculum deferunt.

Quint. Curt. lib. 3. cap. 5

*zed with general cramp, succeeded by ardent heat, and total want of sleep**." The evidence of history is conclusive, as far as historical evidence deserves credit in a medical question, that Alexander was hot at the time when he plunged into the Cydnus. He had surmounted the great passes of Mount Taurus, and descending upon Tarsus towards the sea-coast at an accelerated pace, he may be supposed to have been heated by his exertions, but more certainly still by passing from a cooler to a hotter air. The condition stated must necessarily produce increased heat of surface, probably perspiration; and, if such were the effect of an exerted march and a change of temperature of climate, we find no ground in history, and no probability in the natural circumstances of the case, to suppose that Alexander had been as yet in a state of rest, when the beauty of the waters of the Cydnus caught his eye and invited him to bathe; nor, even had he rested from his toils, can we suppose that the hottest hours of a Cilician summer's day would have permitted his superficial heat to sink below the temperature of health.—Such is the history of Alexander's situation at the time he threw himself into the Cydnus. He was hot; and, as he perspired freely and probably had perspired for some time, we may reasonably conclude that his body was highly susceptible of external impression; in so much that immersion in the cold stream arrested the existing form of action suddenly, and apparently so forcibly that it was doubtful whether or not it would again resume its course. This case then, if it can be admitted as authentic, furnishes an illustration of the fact that the safety or danger of the cold application, instead of being estimated according to the mere degree of heat of the subject to which it is applied, ought to be estimated by the condition of susceptibility and relative power manifested in the organic structure of the system.

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* Αλεξανδρος δε ὥς μεν Αριστοβουλου λελεκται ὕπο καματου ενοσησεν. ὅι δε εις τον Κυδνον ποταμον λεγουσιν, ριψαντα νηξασθαι επιθυμησαντα του υδατος, ιδρουντα και καυματι εχομενον. Ὅ δε Κυδνος ῥει δια μεσης της πολεως. ὅια δε εκ Ταυρου ορους των πηγων ὅι ανισχισουσων, και δια χωρου καθαρου ῥεων, ψυχρος τε εστι και το ὕδωρ καθαρος. σπασμῳ τε ουν εχεσθαι Αλεξανδρον, και θερμαις ισχυραις, και αγρυπνια ξυνεχει.

Arrian. lib. ii. p. 66. Edit. Gronov.

General remark on the cause thro' which the effect is produced.

I have thus stated some facts which relate to the exhibition of cold drink, or to immersion in cold water in the artificial conditions of body produced by exercise long continued, and carried to fatigue, or by other causes of a similar nature which occasion certain degrees of exhaustion. The authors I have noticed above are not yet agreed as to the ground on which the cause acts. Dr

Rush, with many others, seems to place it in high temperature; that is, he supposes the danger to arise from the great difference between the temperature of the body and the water taken into the stomach, or applied to the surface. Dr Currie, on the contrary, supposes the danger of the application to be connected with a low or declining temperature;—that is, a condition where the system, according to his language, is rapidly parting with its heat. If cold water affused upon the surface or taken into the stomach act by subtracting heat simply, it must be supposed, in accomplishing this effect, to act always after one and the same manner; that is, it must be supposed to produce a mean, relatively to the quantity of the cold and the quantity of the heat of the subject, abstractedly of the intervention of organic susceptibility. In this manner, if water of a given weight and quantity be so many degrees below the usual temperature of the animal constitution, and the heat of the subject to be operated upon be so many degrees above the standard of heat in health, the effect, if there exist no controlling force through means of organization, must be supposed to rest in a certain neutral or middle point, calculable according to rule. And on the other hand, if the body be cool, the heat below the just temperature of health, the water cold or near the freezing point, the affusion of a quantity of the specified water upon an animal body so conditioned, may be supposed to reduce the temperature much lower than the just temperature; and thus to occasion all the evils which belong to defect of heat. But, though the effect stated might be expected to be the consequence of the process now described according to a regular and systematic rule; yet we in fact find that, if a person drink cold water with avidity and in large quantity while heated by exercise, exhausted by previous exertion, perspiring profusely, or moderately after having perspired freely, the body, though not hot and glowing exteriorly as before the perspiration began to flow, still hotter than the temperature of health; and while, together with this there is agitation or commotion in the circulating system, fluctuation or ticklishness in the actions of organic movement, a quantity of cold water swallowed suddenly proves injurious, perhaps subversive of life: and, if under other circumstances connected with low temperature, moderate circulation and regular order in organic movement, a similar quantity be swallowed without injury, no doubt can remain that the cold fluid acts by a property different from that of subtracting heat simply. We cannot pretend to define correctly what this property is; but we observe some circumstances closely connected with the operation which seem to bring us somewhat nearer to a knowledge of it. When any one action, or a series of actions is arrested precipitately without destruction of vital organization being implied in the act, a new series arises as a consequence of the application of a new or unusual power of stimulation, or of a power of stimulation usual in kind, but applied with unusual force, or in unusual quantity; yet the action so arising does not always manifest the same degree of energy or effect though the force of the means applied be precisely the same, and though the ostensible condition of the subject, in so far as respects the degree of heat according to measure, be the same or very little different. Now, if the degree of heat be the same, the power of the agent equal, and effect different, we cannot maintain that heat is directly the condition which regulates the action and which gives form to the effect. To comprehend this phenomenon, we must have recourse to certain conditions of susceptibility peculiar to the animal body, varied in degree by many contingent circumstances, and, among others, by the more or less perfect diffusion of heat. This condition of susceptibility modifies the action of the means in such manner, that the impression of cold water which is scarcely felt in one case; or, if felt, which produces no material effect, is felt strongly, and followed by consequences of great import in another. Upon the whole then we conclude that the safe and beneficial application of cold water, employed as a remedy for the cure of fever, whether used internally or affused externally, depends upon a most accurate attention to the susceptible condition of subject, compared relatively with the power or force of the remedy. Thus the power of the remedy, in order to effect its purpose, must be strong and concentrated where the susceptibility is less acute than natural, as happens in ardent fever where the course of the disease is rapid or precipitous: on the other hand, where the system is highly susceptible, a condition which is produced by evacuations, viz. bleeding, purging, sweating, or by inanition from fasting, means of weak power are sufficient to effect impression,—strong ones may subvert life. Hence, a just estimate of the power of the cause relatively with the condition of the subject renders the effect fortunate; a neglect of such estimate leaves the effect to chance, and necessarily implies danger. It is thus that a small draught, or a slight aspersion of the surface with cold water produces no effect, or but a slight effect upon the course of a violent fever with diminished susceptibility of system; a copious draught, or a copious affusion most probably arrests a disease of moderate violence, and opens the case for a renewal of healthy action ; while an excessive measure, in a highly susceptible subject, implies the risk of completely arresting the existing action so as to preclude the return of life : and in a similar manner, a very small quantity of cold water swallowed by the mouth, or a slight aspersion of the surface, refreshes and revives the exhausted and toil-worn subject ; a copious draught, a copious affusion, or entire immersion occasions a local or general arrest of action, cramps, and sudden death.

CHAP. III.

History and Effects of Gestation in the open air in wheel-carriages or other conveyances, employed as a remedy for the cure of certain conditions of febrile disease.

Gestation —new remedy.

THE merits of the external application and internal use of cold water, employed as a remedy for the cure of fever, have been amply discussed in the preceding part of this work; and I should hope that the rule of applying them, in the different conditions of the disease, is there explained in a manner that will be understood by the thinking part of the medical profession. This constituted the main object of my undertaking: it is finished, and I shall only add to it a few remarks on the practice of exposing febrile subjects in the open air, under transport in wheel-carriages or other conveyances, with a view to arrest disease, or to aid in the recovery of health,—a practice which may perhaps appear at first sight to be hazardous. It probably would never have been thought of had it not arisen from necessity; and, it never would have been pursued, had not the striking salutary changes by which it is followed obliged some few persons to consider it with attention. The act of transporting sick persons, particularly those ill of fever, in carts, waggons, or boats, exposed to all the chances of weather, is often submitted to from necessity in military service; but it is then generally considered as a hardship, consequently it is not yet placed among the sanctioned aids, even of military physicians. The exposure to air and necessity of travelling under sickness seem to imply danger; and under this prejudice I should not venture to recommend the practice of which I now treat, were I not convinced from the most unequivocal testimonies of experience, that it is not only safe in itself, but that it is grateful and pleasant to the patient in certain conditions of disease above any other means of solace which the physician's art commands. The benefits derived from gestation are signal in degree, so as not to escape the notice of common observers; but, as it is not generally admitted into the list of medical assistances, it may perhaps be thought necessary that I state to the reader the manner in which the idea of such practice first attracted my notice, and the grounds upon which I have founded my opinion concerning its good effects.

Author's experience in the American war.

In the year 1778, while serving in North America with the late 71st Regiment, I suffered a very severe attack of fever at Kingsbridge in New-York Island. The fever, though in reality of the intermitting class, continued seven days without distinct intermission. It had just ceased, or attained a critical period, when I was put into a common conveyance,—the open stage waggon, to be carried to New York, a distance of fourteen miles from the place of encampment. I was then languid and weak, scarcely able to creep on by the help of a soldier's arm from my tent to the station of the waggon,—not more than an hundred paces. I felt an accession of strength as I proceeded in the journey, and when I arrived at New York I was so much refreshed and so invigorated by its effects that I walked without fatigue, from the place where the waggon halted, to Colonel—the late Sir Archibald Campbell's quarters, which was probably not less than half a mile. The benefit which I experienced, though great in an unusual degree, did not strike me at the time with just impression; and, though I still remember the fact, I do not recollect that I at all reasoned upon it. In the following year, I was again attacked at Ebenezer in the province of Georgia, North America, in the month of July, with fever of unusual violence. The disease was of the form which the ancient Greek physicians denominate *causus*. It had scarcely any remission, though it was fundamentally of the remitting type: the anxieties at the præcordia were inexpressible; the distress scarcely supportable; the sensation of internal heat was great; the external heat little, if in any degree increased; the abdomen was collapsed and lank; the pulsation of the descending aorta strong and vibrating; the pulsation at the wrist moderate in force, perhaps weak, and not much more frequent than natural; the tongue was parched and stiff; and together with this there was an abhorrence of drink, which appeared nauseous and loathsome. The sensations were uncomfortable, the sense of burning was tormenting; yet the surface was frequently damp, and, as judged by the touch, not hot. The desire for something moist and cool was urgent; but nothing cool was to be met with, the thermometer rarely sinking under 96° at any time of the day in the best shaded part of the house where I lay. If my foot, or any part of my body came in contact with any thing of wool or cotton, the irritation thus produced amounted to torture: the distress was great, and with all this there was total want of sleep, a constant desire of changing place and posture—from undescribable irksomeness. In the state described, and at the seventh day of the disease, I was put, by my own desire, into an open cart, or chair as it is termed in North America, to be conveyed to Savannah, a distance of twenty-five miles. The distress and suffering were at this time at the highest pitch possible; but I cannot pretend to give an accurate idea of it in words. It comprehended the essence of torture—without local pain. I commenced my journey in the state described; but I had not travelled two miles before my uneasiness had sensibly diminished; the objects around me began to attract my notice, and I began to feel pleasure in myself. It rained heavily while I was on the road; I had no protection from it, and I was as completely drenched by it as if I had been thrown into a river; but before I reached the end of my journey, I considered myself as comparatively well. I was able to sit up, to walk without help; and, when I arrived at Savannah, I had a desire to eat something salt, though for the seven preceding days I had looked at food with abhorrence, and loathed drink with a tongue stiff and parched—even scorched to insensibility by internal heat.

The benefit, which resulted from the act of gestation in the open air in the two instances stated, was conspicuous; but, as the fever had actually ceased in the one, and as it might be supposed to be near a critical period in the other, the case might still be held to be undetermined in so far as relates to the extent of the salutary powers of gestation. But, if the fact of the benefit might be here doubted, it was fully exhibited, and I think completely confirmed by the example which happened in the late 71st Regiment in the year 1780, at the time that corps retired from the Cheraws, preparatory to the action at Cambden on the 16th August. This example applies to the case in all points; and it may in fact be considered as proof of the highest authority touching the character of this practice. The position, occupied by the 71st Regiment at the Cheraws on the river Pedie, was a singularly unhealthy one: the sickness was general, and the character of the disease was similar to that which prevailed at Ebenezer in July 1779, —remitting, but with remissions scarcely perceptible. Two-thirds of the regiment were numbered in the sick-list; of course it may be supposed that there were here persons in all stages of disease—from commencement to late stages. The enemy approached in force, and the 71st was ordered to withdraw, for it was the advance of the army. Some part of the sick were embarked in boats in order to be conveyed to George-town by water; for the case was urgent, and the means of the country were not sufficient to afford waggons for the transport by land of all those who were unable to march on foot. It is reasonable to suppose that the least serviceable subjects were selected for embarkation on this occasion, and probably the cases which threatened the greatest danger. This division fell into the hands of the enemy soon after it left the Cheraws, and as it was widely dispersed in the country, I could obtain no certain information respecting the history of its health; but, of about one hundred and twenty of the first battalion who were placed in open waggons, crowded and uncomfortably accommodated, exposed to dews by night, a scorching sun by day and occasional showers of rain, the majority were recovered, or recovering by the end of the third day, when we arrived at Lynch's Creek, which is about half way between the Cheraws and Cambden, and near which the regiment halted to occupy a defensive position. The sick, as might be expected, had little or no opportunity of taking medicine during the march. Whatever changes occurred may therefore be allowed to have arisen from causes connected with the journey, viz. the motion and exercise implied in travelling, the change of place and scene, and perhaps the rude exposure to weather. A great proportion of those who were sick at the time of leaving the Cheraws were now entirely well; and others, in whom the disease had not-yet entirely ceased, might be said to be convalescent; for the form had changed from obscure remittent to that of distinct ague and fever.

The instances, which I have now submitted to the reader, shew very clearly that gestation possesses the power of arresting and changing the course of actual disease; or of forwarding the recovery of health by supplying rapidly, but in a manner we do not pretend to explain, the material of strength to those who are convalescent. The last-mentioned history is striking; and from the date of it I viewed the knowledge of the fact as leading to inferences of value to the military practitioner, if not to others. I observed myself, and perhaps others did the same in the course of the American campaigns, that the simple act of transporting the hospital subjects for a few hours in open waggons, exposed to all chances of weather, forwarded the recovery of the convalescent, and even sometimes acted more effectually upon those who were in the state of actual disease, than all that the skill and diligence of the surgeon were capable of doing, by means of drugs and diet in a fixed quarter or stationary hospital, during a length of time. Aware of this truth, I therefore, as far as depended upon my limited authority, returned the hospital subjects to their companies at an early period of convalescence. It was a standing order, as it is in most corps, that the convalescents should be exercised regularly, but that they should not be fatigued by exercise, that their progress in recovery should be watched by the non-commissioned officers, and further, that they should be directed, in the event of marching, to accompany the baggage waggons with the view that they might be assisted on the march in proportion to their needs. As it was provided by this arrangement that they should arrive at their destination in proper time, and that they should not be under the necessity of exerting themselves beyond their ability, no hardship was incurred, and the hospital list was kept within comparatively narrow bounds. The reason for making such arrangement is an obvious one; and I cannot help pressing the subject on the notice of military officers; for it is evident that any regiment, which institutes a similar economy, will have it in its power to bring forward many firelocks into action in time of need, which, without such arrangement, would be altogether ineffective. But further, the measure stated not only keeps the sick-list low, but it cuts off the sources of the invalid list; for it is a fact well known to military surgeons, and it cannot have escaped the notice of military officers of discernment, that diseases of the field, where the medical system is laid on good foundations and well executed in practice, are ordinarily short in duration; that relapses, where they do occur, are slight comparatively with those which happen in hospitals; that bodily strength, and more especially the military mind suffers a small check by the effect of sickness. This is an admitted fact; and the proofs which I have now given respecting the safety and benefit of gestation, as they sanction the adoption of the mode of discipline recommended, so they are of the utmost importance to the interests of an active army. If the surgeon of a regiment understand the principle aright, and if he receive the support from his commanding officer which he ought to receive, his corps may be preserved, not only in comparative good health, but even its less effective parts may be so organized as to contribute something towards the greater objects of warfare: If they do not take their place in the line in the time of action, they may at least guard the baggage in a given position; and thus perform a service which often takes up a considerable portion of the best effective force of an army.

Author's experience in the war 1793.

Facts similar to those I have stated, as they were often repeated, so they were well verified in the course of the American war. The events of the war of 1793 presented many of a similar kind, not less precise and distinct than those now mentioned. As it would be superfluous to go into much detail on a subject which may be considered as demonstrated, I shall only notice a few occurrences, in so far as they may be thought to be serviceable in removing prejudice, or in informing the young military practitioner respecting some important points of his duty. The general good effect of moving febrile subjects through the open air, particularly such as suffer from bilious remitting fevers in hot climates, were strongly exemplified in my own case at my removal from Ebenezer, and in the 1st battalion of the 71st Regiment at its removal from the Cheraws, preparatory to the action at Cambden on the 16th August 1780. These were clear and unequivocal; but to these I have it in my power to add others of later experience, where gestation was eminently useful in other countries and in fevers of a different character from that alluded to. In the year 1794, the Buff or Third Regiment of Infantry was disembarked from transport ships in a sickly state and cantoned at Lymington in Hampshire. An infectious fever prevailed in this, as in other regiments then under the command of the Earl of Moira. A man of the Buffs—a corporal, had been ill of a fever for some days when I first saw him; for, being at a remote quarter, and having been neglected to be reported by the non-commissioned officer, he was not visited till the disease had passed the period which affords the fairest opportunity of cutting short its course by the employment of bold means. He was however at last brought to the regimental hospital, and placed in an apartment by himself. The means prescribed for his relief produced no favourable change in the circumstances of his case; he appeared in fact to be approaching fast to his end: the pulse was small as a thread, frequent and low, in fact scarcely perceptible; the heat was less than natural; the skin was damp and greasy; the countenance sallow and dirty, notwithstanding that it was repeatedly washed; the voice was scarcely articulate; the power of swallowing was imperfect; the urinary and fecal discharges passed unconsciously or involuntarily. The case seemed desperate; but as the respiration was comparatively easy, and no symptom existed which indicated the direct suffocation of any one of the important internal organs, I could not abandon him to his fate. In this state of things then, precarious as it seemed to be, he was carried to the door in a blanket and placed in a wheel-barrow, accommodated with straw, a pillow and such other conveniences as contributed to make his posture easy. He was then moved over the pavement, his face and breast being exposed to the cool and fresh air in the month of February. He was evidently, and almost instantly revived; he opened his eyes, looked at those who were near him with seeming satisfaction and pleasure, drank a glass of wine and eat an orange, spoke articulately and even clearly: the pulse expanded itself,—it became distinct and regular; the skin seemed drier—comparatively pleasant to the touch as if animated by a new diffusion of life and heat. He remained in the open air for an hour at least, during the greater part of which time he was wheeled about on the pavement; an act, which seemed to communicate to him very pleasant sensations. As I accompanied him in his airing, I was capable of perceiving the progress of his revivification; it was sensible at every step. From this time his recovery dates itself, and it was in every way a speedy and perfect one.—I mention the above case as an example defining a condition where gestation may be used with safety, most probably with benefit when other means are exhausted.

The Buff, with which I served for some time in the early part of the late war, was one of the regiments composing the army which retreated from Holland in the latter part of the year 1794 and beginning of 1795. In the course of this campaign, the opportunity was often presented, or rather the necessity was often incurred of removing the sick from the regiment to the general hospital; and it was commonly then remarked that the act of transport was attended with a fortunate change in the circumstances of the disease, particularly where the symptoms were of moderate force, and where the febrile action was manifested in the system generally. The opportunity of witnessing this effect was best exemplified where the regimental sick were transported in waggons in the train of the regiment during the latter part of the retreat. The act of gestation was evidently and almost uniformly productive of benefit. It acted manifestly as a strong power in promoting recovery where the disease had been of such continuance that its forward course became languid; or, where previous evacuations had been employed freely, so that fulness and distension, which implied a kind of morbid torpor, were diminished or removed. On the 31st of December 1794, the Buff was ordered to break up from Lent near Nimeguen and to send its sick to an hospital in the neighbourhood of Arnheim; a distance of ten miles, or more. The weather was then intensely cold; the number of sick to be removed amounted to forty-five; the majority of whom were already convalescent, but not so far recovered that they could be allowed to remain with a corps which was placed in a state of alert service. The arrangements were made for the removal, and it was remarked in executing it, that the convalescent were improved into apparent health by the mere effects of the journey; the slighter forms of disease were advanced in a few hours to the stage of convalescence. The change was remarkable in the Buff; it was not so evident in the sick of other corps who moved at the same time and repaired to the same destination; many of these, and I was present at their arrival at the general hospital, were in a most pitiable condition—loaded with disease to extremity. This is the fact, and when we come to estimate causes and to decide on the reasons of things, we shall probably be able to discover grounds for the difference of the effect now stated. The sick of the Buff were evacuated early and freely, rarely indeed bled; but an emetic almost always, often a purgative of severe operation, sometimes calomel with James's powder, frequently large blisters and aspersion or affusion of cold water were employed within the first twenty-four hours from the attack. Such was the general medical discipline in the Buff: It was not common in the army at the time stated; and it may thus be supposed that the sick of other regiments, when exposed to the open air did not stand at the same point of impression as the sick of the Buff; or, if any had attained the same point, it was only accidentally; so that the benefits of gestation were not apparent as a general effect. In the subsequent part of the retreat, at least from Deventer to Bremen, and from the 20th of January to the beginning of April, the Buff sent no sick to general hospitals; for it now, in common with other regiments, obtained permission to hire or press waggons for the transport of its encumbrances, and among others for the transport of its sick. In the first six weeks of this period, the hospital list was rarely under thirty; for several persons, who had been sent to general hospitals at different times in the event of marching, were now met with on the route and added to the sick list of their proper corps. During this latter period, about seventy febrile patients passed through the regimental hospital. Of these one died, a person who had been ill at an outpost for three days before any thing was done for him; consequently, who had gone beyond the period which presents the best opportunity for arresting disease precipitately, or for turning it into a safe channel by a bold practice. The effect, which the act of transport produced upon the sick and convalescent in this retreat, was here well ascertained. I can speak from observation, for I always accompanied the hospital waggons, and thus had an opportunity of marking the occurrences with accuracy. The weather, as I have already remarked, was sometimes intensely cold; strong frost in the early part of it, rains and fogs in the latter. Under these inconveniences, the sick were moved in the rear of the corps; and, though they were sometimes ten hours or upwards in the open air, I was not able to discover any material injury produced as the effect of such hardship; on the contrary, the benefit was for the most part great and visible. The sick were placed in the waggons with all possible care, the convalescent and strong sitting up; those who were weak and actually ill, laid at length upon clean straw, the feet and legs covered with straw where there was deficiency of clothing or where the weather was unusually cold: they were, notwithstanding all this care, often exposed to rain, for the waggons were open waggons. Such is the amount of my observation concerning the effects of gestation upon the sick of the Buff in the retreat through Holland in the year 1794 and 1795. There were, I believe, some other persons on this service * who noticed the benefits of gestation in febrile subjects as well as myself; but I do not know how far any of them defined its conditions, or considered the subject with its reasons as an act of the healing art. The disease, which principally prevailed among

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* Dr Wake in his Inaugural Dissertation at Edinburgh, 1807.

the infantry of the British army at the period of which I speak, was a fever of an infectious character. Its virulence was increased to the highest pitch by accumulation of the sick in hospitals; it was suffered to spread through the line by neglect of discipline, or ignorance of economy; and its ravages were diffused among others by an unwillingness to destroy infected clothing because it was the Colonel's property.

In the autumn of the year 1795, a detachment of troops was collected in Ireland at the Cove of Cork for the service of the West Indies; it was detained however in harbour, by contrary winds, till the month of February 1796. An infectious fever arose in the mean time in most of the corps, and it attained in many of them a signal virulence by accumulation in transport ships and other obvious causes. In transporting the sick from the ships in harbour to the hospitals on shore in windy and stormy weather, more or less amendment in condition was usually perceivable in the slighter cases; no favourable change was discoverable in the more aggravated. It is however to be remarked in this place, that the time occupied in the transport alluded to seldom exceeded an hour; on the Continent, on the contrary, the sick were often in the waggons for eight or ten hours; while, with this duration of journey, there were combined a succession of movements in open air, joltings and jumblings on bad roads necessarily producing exercise, and even effort in the subject, all which probably contributed considerably to the success of the effect. In the West Indies, more expressly in St Domingo, the act of removing the sick from crowded quarters to well ventilated hospitals, even the transport of sick from one station to another always occasioned changes, and the effects corresponded relatively with condition of the subject upon whom the experiment was made. The changes were fortunate where the force of the disease was previously broken, or the violence of its course abated; it was otherwise in cases of the most aggravated kind, particularly in their early stages. I shall state a fact, which may be considered as an example of what I mean: A regiment of Europeans, stationed in the plain Cul de Sac in St Domingo, in the year 1797, was ordered to Port au Prince, previously to its embarkation for another destination of service. The sick were placed in waggons, and ordered to move in the rear of the corps. Those, who had been evacuated freely in the early stage of fever, were evidently benefited by the journey: many of them were apparently placed by it in a state of convalescence; on the contrary, those who had been recently attacked, and in whom no evacuations had yet been made, were apparently injured; at least they arrived at Port au Prince with symptoms of unusual aggravation, particularly with marks of effusion into the ventricles of the brain, probably owing in some part to the effects of travelling in a scorching sun, in some part to the effects of liquor which on all such occasions was too easily obtained. But here, as in all other instances which have fallen under my observation, the changes were remarkable and the effect highly salutary, where the disease had assumed the bilious remitting form, similar to what is called *causus* by the Greeks; or where excessive mobility, fainting or disposition to faint, want of sleep, irritability and restlessness, were its more prominent symptoms.

It would be superfluous, after what has been already said upon the subject, to accumulate examples of the benefits of gestation in open carriages in the convalescent stages of fever, whether in tropical or in temperate climates. The good effects are proved demonstratively in that condition; they are even apparent in many cases of actual disease. But, that gestation may be resorted to, only where it has a chance of being useful, for it is not useful in all conditions of subject, we must endeavour to discover the ground on which it acts as a remedy, either in arresting the course of fever, or in forwarding the languid action of health. The pure air of the atmosphere is the obvious agent which stimulates and supports animal life; but its force is evidently multiplied by the act of progressive motion in wheel carriages; for its animating influence is then applied with increased impulse and in rapid succession; while the subject himself, agitated and rouzed by exercise, is placed in the condition of being more easily acted upon than if allowed to remain at rest in one position. The change which follows the combined operation of the causes stated is often signal; but the condition on which this salutary effect may be supposed to depend is not yet precisely defined. Gestation in fact is not useful, perhaps not safe in every form of action which a febrile cause assumes, not even safe or useful in every stage or condition of the same identical fever in the same subject. It is commonly known that slight febrile indispositions are liable to be turned off in their beginnings by the effect of exercises in the open air, —so severe in themselves, or pursued with such animation and interest as to impress the habit strongly. This is true; but it is not thence to be concluded that the commencement or early stage of fever is the only, or even the proper period at which the greatest benefit is to be expected from the effect of this remedy. Fever we observe is a disease of a peculiar movement, possessing a defined duration, various according to conditions of subject and cause, but such as exhibits within the extremes of its circle occasional points of rising and falling, implying a course, now more languid, now more intense. It is consonant with reason, and we see it proved in experience, that stimulating powers act with greatest effect at the point of febrile remission, that is, when the rapid course abates. And hence it follows that it is principally at that point where the diseased movement has completed its circle, whereby the natural susceptibility of impression is again restored, that the action of pure air, as applied to the languid body in progressive motion in a wheel carriage, is signally beneficial,—it is then rapidly restorative of health. This happens according to the natural course, sometimes after the third, but more generally not till after the fifth or seventh day. Certain circles of febrile movement are completed at these periods. This fact is known to accurate observers, and hence the knowledge of the fact enables us to comprehend in some degree how the stimulation of fresh and pure air, applied with impulse in rapid succession in the progressive motion of travelling, should become sufficiently impressive at these times to solicit the moving power to resume the customary form of healthy action, viz. the action which had been artificially perverted by the stimulation of a foreign cause constituting error or disease. But while the fact stated accounts for the success of gestation at this period; yet if we omit to apply the stated means at the favourable time, instead of the renewal of healthy action alluded to, a diseased movement probably recurs, though under another form: another course of error then commences, proceeds towards its termination according to a given rule of progress, unless interrupted in its course by the application of causes of strong power, stronger in fact than the action of customary stimulations. If we admit this position, and it is a fact open to common observation, we cannot fail to conclude that the period, most proper for the safe trial of gestation in the open air, is more peculiarly the point of time when the diseased movement has completed its circle; at least, when it has become languid in its course, either naturally by its own operation, or artificially by bleeding and emetics, the use of purgatives, antimonials, or other similar means, which tend to bring the system to a level condition. The one is to be considered as a natural period of change—the regular termination of a diseased movement; the other artificial,—a termination effected by force of treatment. In both, susceptibility is restored; and the means in question applied in this susceptible condition produce effects equally decisive, whether the condition alluded to be the operation of nature or art. On the contrary, gestation is not productive of salutary change in the actual vigour of the disease, viz. in that torpor or insensibility to external impression which arises from strong existing action of the vascular system. It is thus ineffectual, or it may be contingently dangerous in the early period of strong and precipitous fevers; it is safe and useful in the latter stages, where susceptibility of impression is restored to the system generally, and where no important organ is fundamentally deranged in its structure by the force or effect of the preceding action. The free affusion of cold water, as was remarked above, has the chance of being dangerous in some delicate conditions of fever; even aspersion must be made with caution; yet no case has occurred to me of so great delicacy, where I hesitated, or where I would hesitate to recommend gestation in the open air in a suitable conveyance, provided the case was not complicated with local injury of an inflammatory nature tending to suppuration or effusion;—in that case I admit it could not do any good, in all probability it would do harm. It hence appears plainly, from what has been said, that the basis of preparation, whether attained naturally or artificially, rests on the existence of general susceptibility—

with the exemption from local congestion or fixed organic derangement. With this basis in view, we are enabled to comprehend the difference of effect so often observed among individuals or masses of people, as they are prepared by evacuations and other treatment so as to exhibit a simple condition of disease; or as they exhibit diseases complicated in their circumstances according to what they are as presented by nature.

I have noticed cursorily the safety and good effects of gestation in the open air at certain periods and in certain conditions of fever; the inefficacy, or even the danger at others. The simple character and the susceptible condition present the favourable circumstance; the complicated character and the unimpressible condition bar the expectations of benefit resulting from this form of remedy. Gestation in open air in wheel-carriages promises no good in general fever with strong vascular action, or with plethora at any period of the disease; it may even produce mischief, as disposing to effusion in internal organs by succussions and joltings, and other causes acting locally. As it may be dangerous contingently in the case stated, it is directly injurious, and we can easily conceive that it must be so, in fevers where inflammation already exists in some internal organ, whether head, heart, lungs, liver or intestines. It is thus hurtful in phrenitis, pneumonia, hepatitis, inflammatory dysentery, whether acute or chronic. It is on the contrary of the most marked benefit in cases of irregular determination, even in cases of congestion in secreting organs not tending to inflammation, as in the bilious remitting fever known by the name of *causus,* and distinguished by anxiety at the præcordia, sensations of burning heat, restlessness, want of sleep; in short, by all the aggravated symptoms which are usual in the bilious autumnal fevers of hot countries. It was in this form of fever that its good effects were so conspicuous in the 71st Regiment at the time that corps retired from the Cheraws; and it was generally beneficial in a similar proportion in other subjects in similar conditions in the American campaigns. The American fever of these days possessed nothing of the malignant in its nature. Many died of it indeed; but great mortality was more the fault of treatment than intrinsic danger in the nature of the disease. The system was here generally susceptible and easily acted upon: bleeding was rarely necessary; emetics, purgatives, blisters and opiates occasionally, with large doses of Peruvian bark, were capable of commanding the fate of the American fever every where with an almost calculable certainty. But though gestation in the open air, which implies in its nature change of place and scene, is a remedy of great value in periodic fever in most of its circumstances; and, though its effects are conspicuous in the late, low, and reduced condition of subjects in continued bilious fever in tropical climates, and generally conspicuous in proportion to the languor and feebleness of the subject, in so much that many persons, who have been lifted into a carriage in arms, have in the course of an hour or two been so invigorated as to step out of it without help, and walk to their apartments with firmness; yet it is not useful, it even may be dangerous in continued and concentrated fevers in the vigour of their course. Hence it is evident, in looking at this subject in all its views, that the febrile state must be brought to a low standard where gestation is employed as a remedy for the cure of the disease; and where travelling is submitted to in necessity, as in military service, care is especially necessary that local affections be previously removed by bleeding or other means more particularly adapted to the case. As the act of gestation in the open air is of signal benefit in fevers of the bilious form and properly of a remitting type; so it is of singular use in most conditions of those fevers which arise from general infection, and which are aggravated by impure air. This is true, and as the cause of its truth is easily understood, it will be superfluous to detain the reader with farther illustration of the subject. I only remark that the remedy may be here resorted to without much preparation of the case; because the infectious fever more rarely than others assumes real inflammatory action, and because susceptibility is rarely lost under the intensity of a forward and precipitous circulation; and farther, because the impression of the pure air is proportionally increased, in as much as it is opposite to the condition of air in which the subject was so lately placed.

The benefits of gestation are witnessed in a striking manner where the diseased action has actually ceased, but where the recommencement of the healthy movement is slow, the forms of its action imperfect. In such case, it is proved by undeniable testimonies of experience that more benefit is obtained, and more strength visibly gained by the act of travelling for six hours in an open carriage exposed to all the chances of weather, than by the best medical treatment that can be devised in a crowded hospital, or in the stagnant air of a solitary chamber in the space of six days. The fact is also true, and we can easily understand the reason of its truth, that the greater the contrast between the condition of the sick apartment and the condition of the open air, independently of the mode of gestation, the greater is the effect upon the health of the subject of the experiment. But though the good effects of gestation be in themselves conspicuous, they are at the same time much increased by ablutions, by an entire change of clothing, and by frictions, both before the journey is undertaken and after it is finished. The act of gestation alluded to does not produce such a strong and instantaneous effect as the affusion of cold water; but its effects are safer in delicate conditions of disease, and it may be rendered more permanent; because it may be continued till the salutary action is not only moved, but till its course is confirmed. Hence it is that travelling from necessity, as in military service, is often more decisively useful than short airings in an easy carriage; for in military service circumstances are so combined that impression is not only made upon the subject and a consequent action produced, but that the action is confirmed by a long continued application of the causes which gave it birth. It is an obvious fact that the impression of pure air stimulates animal life into action; the impression of pure air combined with exercise is commonly admitted to be the cause which maintains health and vigour.

The remedy, now so strongly recommended to the notice of the public, is not yet numbered among the regular means of physicians as a remedy for the cure of fever; but the benefits so evidently derived from it decree that it should; and the view which has now been given of its history and management will, it is presumed, be sufficient to attract attention and furnish information at what times it may be employed with safety and with probability of doing good. If it should not do all that some may be disposed to expect from it, the most scrupulous may be assured that it implies fewer chances of doing harm than perhaps any other means of equal power within the circle of medical aid.

THE END.

Abernethy & Walker, Printers,
Old Bank Close.

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MAR 17 1911